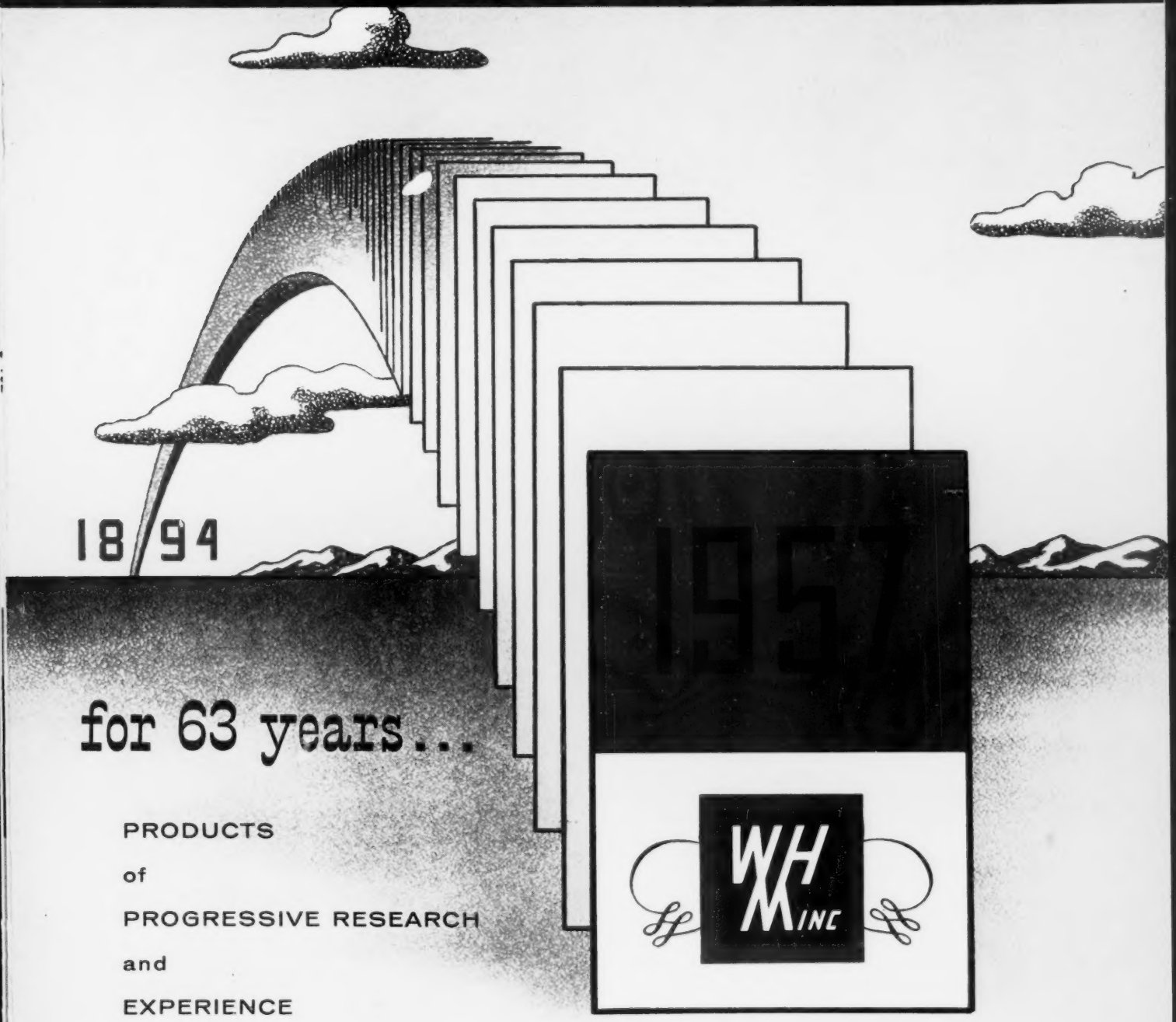
Founded in 1832

RAILWAY LOCOMOTIVES AND CARS

JANUARY 1957

One of Five Simmons-Boardman Railway Publications



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LESS THAN A TEASPOONFUL
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Railroad after leading railroad is racking up lubrication records like the one mentioned above—taken from case history files.

The facts are simply that *Texaco 979 Roller Bearing Grease* holds up and lubricates as no other grease. It does not get soupy. It resists leakage, stays in the bearing, and retains its lubricating qualities year after year, in hot weather or cold.

Texaco 979 Roller Bearing Grease is AAR-approved—your best bet for better lubrication, longer bearing life and lower maintenance costs.

To learn more about how *Texaco 979 Roller Bearing Grease* can help you, call the nearest Texaco Railway Sales Office, in New York, Chicago, San Francisco, St. Paul, St. Louis, or Atlanta. Or you may write: The Texas Company, *Railway Sales Division*, 135 East 42nd Street, New York 17, New York.

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TEXACO Railroad Lubricants
AND SYSTEMATIC ENGINEERING SERVICE

IN ALL 48 STATES

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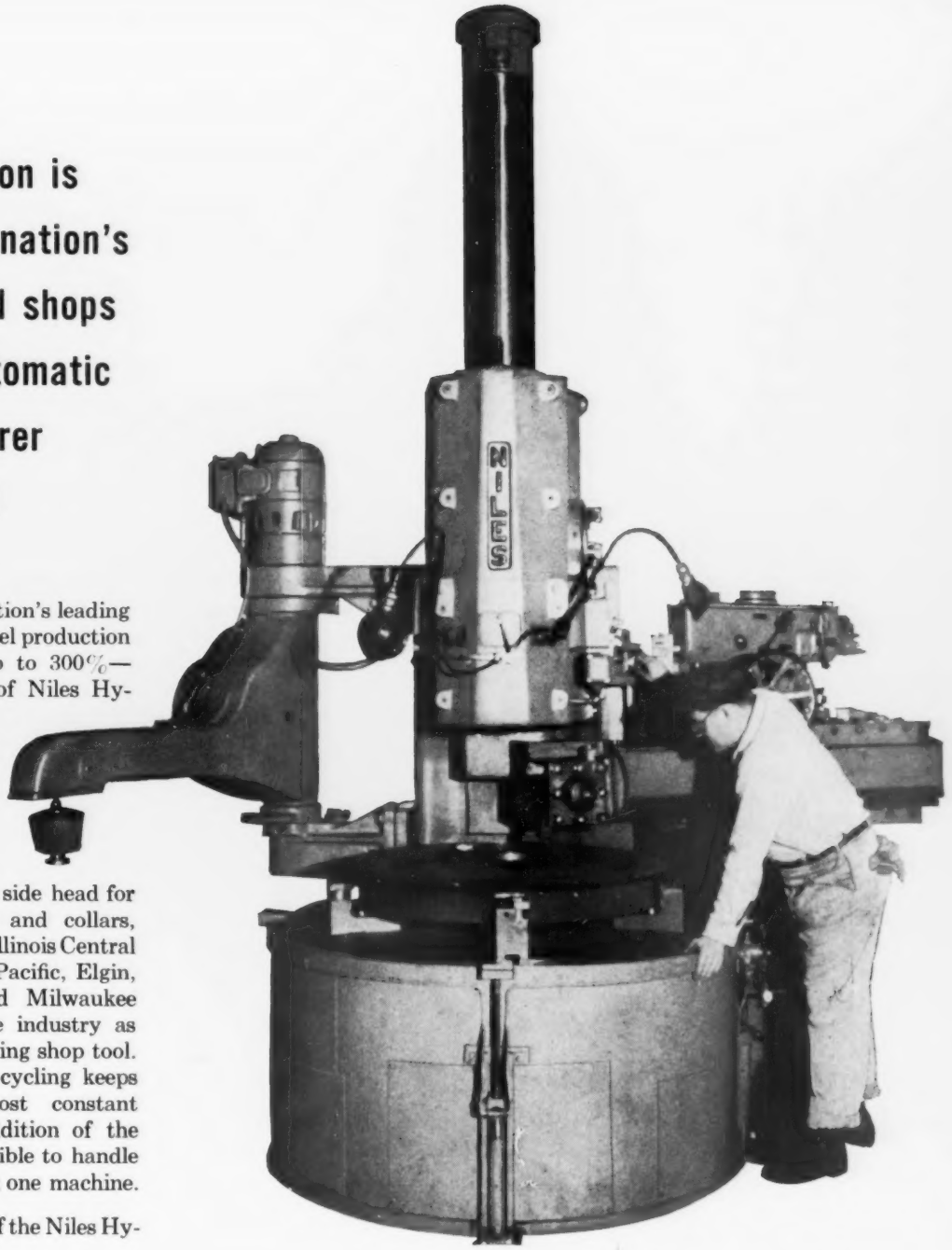
Wheel production is soaring in the nation's leading railroad shops using Niles automatic cycle wheel borer with side head

Railroad shops of the nation's leading carriers are boosting wheel production —in some instances up to 300%— thanks to installation of Niles Hydraulic Wheel Borer with side head, and to other fast, efficient Niles railroad shop tools.

Pictured here is a new Niles wheel borer with side head for machining hubs, rims and collars, recently installed in an Illinois Central shop. Soon the Union Pacific, Elgin, Joliet & Eastern, and Milwaukee Railroads will join the industry as users of this money-saving shop tool. Automatic boring feed cycling keeps the machine in almost constant operation. And the addition of the side head makes it possible to handle car and diesel wheels on one machine.

Write today for a copy of the Niles Hydraulic Wheel Borer Bulletin—with complete specifications and operating data. Find out how you can materially cut your shop costs. Address Dept. 9030.



Pictured above is a new Niles wheel borer equipped with side head recently installed in Illinois Central's Burnside shop, Chicago, Ill.

ALL OF THE NATION'S LEADING RAILROADS ARE USERS OF NILES RAILROAD SHOP TOOLS

Hamilton Division Hamilton, Ohio

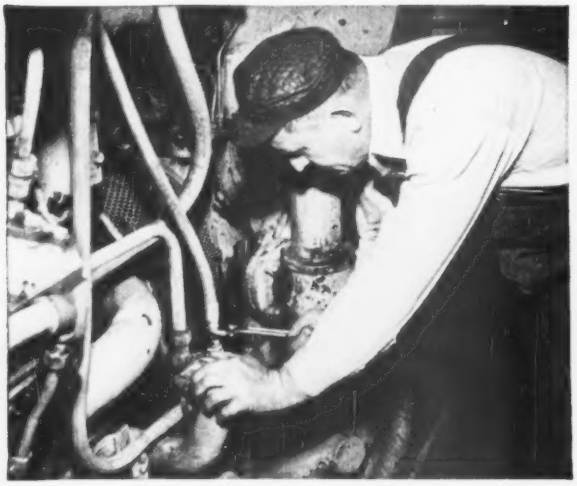
BALDWIN · LIMA · HAMILTON

Diesel engines • Mechanical presses • Can making machinery • Machine tools

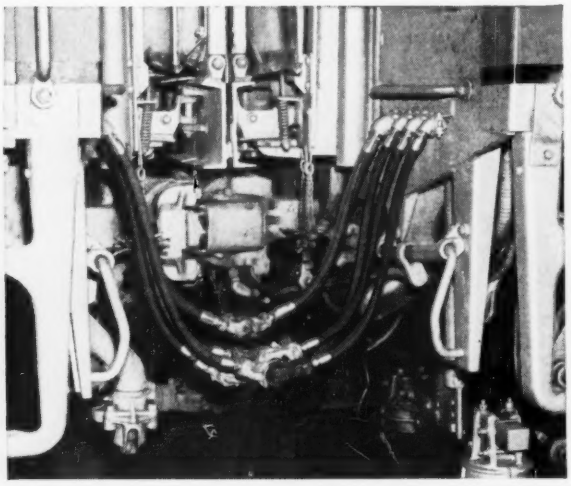
BALDWIN BLH LIMA-HAMILTON

4 Ways to Cut Costs...Save Time

with Aeroquip Hose Lines and Fueling Couplings



1. Eliminate Piping Failures due to vibration and stress by using Aeroquip Flexible Hose Lines. Many railroads have reduced locomotive downtime by replacing rigid piping with flexible hose on fuel, lube oil, air and water lines.



2. Reduce Replacement Costs of air brake lines on locomotives and passenger cars with Aeroquip Air Brake Hose and Detachable, Reusable Fittings. By using the fittings again and again, one railroad saves thousands of dollars each year.

3. Reduce Downtime. Make your own replacement lines quickly by assembling Aeroquip Bulk Hose and Reusable Fittings in your own shops, as they are needed. Installation time is reduced, too, because forming and fitting problems are eliminated.

4. Save on Fuel Costs by equipping diesel locomotives with the Aeroquip Self-Sealing Fueling Coupling. It eliminates fuel loss on connection and disconnection of refueling lines, speeds the refueling operation and reduces fire hazard.

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REG. TRADEMARK

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RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal

JANUARY, 1957 VOLUME 131, No. 1

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NEXT MONTH:

New Series starts on Diesel Repairs, "Roll Them Out Like New."

Three Land Transportation Sessions, January 21-23

Twelve papers on land transportation are scheduled for presentation at the Winter General Meeting of the American Institute of Electrical Engineers to be held in the Hotel Statler, New York, N. Y., January 21-23. During the three sessions, latest advances in electrical engineering aspects of locomotives will be discussed. The programs will be as follows:

MONDAY, JANUARY 21

10 AM

"An 8500-Horsepower Gas Turbine-Electric Locomotive," by R. M. Smith, General Electric Company.

"Progress in the Development of the Gas Turbine-Electric Locomotive," by F. D. Gowans and A. H. Morey, General Electric Company.

"The Case for a Standard System of Railroad Electrification for the American Railroads," by T. F. Perkinson, General Electric Company.

TUESDAY, JANUARY 22

9:30 AM

"Electrical Equipment of the New Haven Speed Merchant Locomotives," by T. T. Means and R. M. Henderson.

"Electrical Aspects of High Speed Self-Propelled Trains for the New Haven," by J. E. Burton, the Budd Company.

"Diesel Locomotives with Mechydro Hydraulic Transmission for Lightweight Trains," by S. E. Steinbrook, Baldwin-Lima-Hamilton Corp.

"Design and Analysis of the Motor-Alternator Speed Regulator for the New Haven Speed Merchant Locomotive," by S. W. McElhenny, General Electric Company.

TUESDAY, JANUARY 22

2 PM

"Rectifier Locomotives for the Virginian Railway," by J. C. Fox, Virginian Railway Company.

"The Electric System of the Rectifier-Type Locomotives for the Virginian Railway," by J. C. Brown, General Electric Company.

"Design of Ignitron Tubes for Rectifier Locomotives," by B. E. Belnap, J. L. Zehner and H. E. Zuvers, General Electric Company.

"Report on Progress and Trends in European Electrification," by E. H. Brown, C. B. Lewis, and D. R. MacLeod, General Electric Company.

"Design Considerations for Rectifiers for Railway Locomotives," by C. C. Herskind, J. E. Hudson and W. R. Kettenring, General Electric Company.

Personal Mention

Atchison, Topeka & Santa Fe

W. C. ELLISON has resumed duties as master mechanic, Pecos division, Clovis, N.M.

Canadian Pacific

PETER J. JOHNSON, assistant superintendent of motive power, Eastern Region, Toronto, Ont., retired.

LEONARD WINSLADE appointed assistant superintendent of motive power, Eastern Region, Toronto, Ont.

R. MACDONALD, general locomotive foreman, Winnipeg, Man., appointed division master mechanic, Brandon, Man.

W. J. HOLLOWAY, division master mechanic at Edmonton, Alta., retired.

H. GELL, division master mechanic at Brandon, Man., transferred to Edmonton, Alta.

Chicago & North Western

VICTOR C. BARTH, assistant engineer of tests, appointed chief metallurgist and engineer of tests, Chicago.

Victor C. Barth

Chicago, Rock Island & Pacific

DAVID H. NOBLE, formerly electrical engineer, Central of Georgia, is now research electrical engineer, at Chicago.

Illinois Central

J. R. MITCHELL, division electrical foreman at Clinton, Ill., appointed to newly created position of assistant electrical engineer of equipment at Chicago.

K. G. CARRIERE, diesel supervisor at Chicago, appointed division electrical foreman at Clinton, Ill.

J. T. JONES appointed diesel supervisor at Chicago.

New York Central

W. C. WARDWELL, general mechanical superintendent, Eastern district, appointed general mechanical superintendent—locomotives, system. Headquarters, New York.

Eastern District, New York

E. H. WRIGHT, formerly assistant mechanical superintendent, Western district, appointed mechanical superintendent.

B. L. STROHL, assistant general mechanical superintendent, appointed assistant mechanical superintendent.

Appointed Master Mechanics:

W. A. ALFKE, St. Lawrence, Adirondack and Ottawa Division, Watertown, N.Y.

V. T. BURNS, (car) Electric, Harlem and Putnam Divisions, Mott Haven, N.Y.

C. W. COLE, Syracuse-Rochester Division, Syracuse, N.Y.

J. F. COONEY, Syracuse-Rochester Division, Syracuse, N.Y.

J. E. DEFREEST, Mohawk-Hudson Division, Albany, N.Y.

F. L. HOFFMAN, (locomotive) Electric, Harlem and Putnam Division, Harmon, N.Y.

S. O. HUGHES, Boston & Albany Division, Boston.

L. C. LYTLE, Buffalo Division, Buffalo.

P. R. OLIVER, (car) Electric, Harlem and Putnam Divisions, Mott Haven, N.Y.

R. J. PARSONS, New York Terminal District and River Division, Weehawken, N.J.

T. A. RHOADS, Pennsylvania Division, Avis, Pa.

Texas & New Orleans

P. B. RICE, master mechanic, Houston division and Houston Terminals, has assumed the additional duties of master mechanic, Dallas and Austin divisions, with headquarters at Ennis and Houston, Tex.

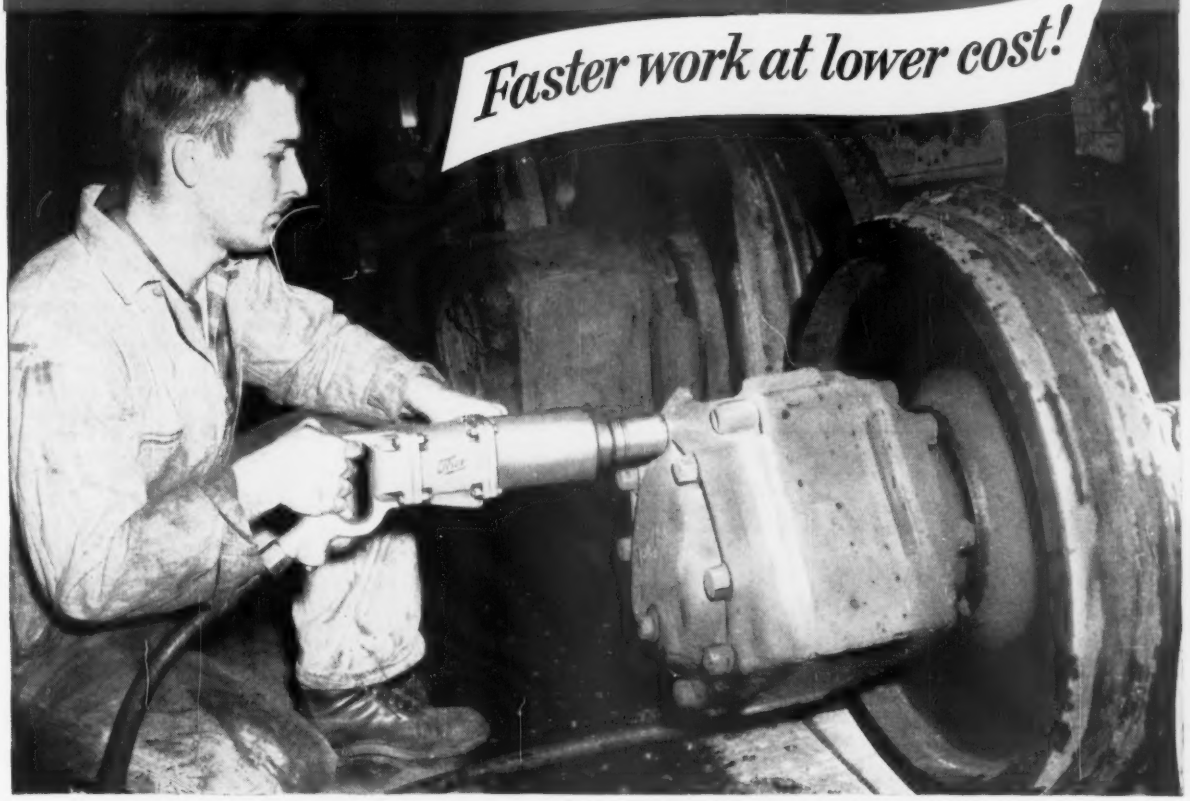
Obituary

JOSEPH LYNN PERKINS, superintendent of shops, Marshall, Texas, died on November 2.

Made to order for railroad shops!

THOR AIR IMPACT WRENCHES

Faster work at lower cost!



THOR Reversible Air Impact Wrenches save a lot of time and money on every operation involving nut running, screwdriving, reaming, tapping, applying and removing studs. Thor Wrenches work faster, with less stress on working parts, because they spin nuts down tighter before impacting. Thor reversible power removes "frozen" nuts, bolts, and screws in seconds. And because there is no torque reaction, Thor Air Impact Wrenches are completely safe.

Low maintenance is assured because Thor ball-bearing motors are fitted into wrenches as self-contained units. Oversize spring never wears out. Finest tool-steel gears are precision cut and heat-treated for endless wear. Thor's line of accessories meets every need. Ask your nearest Thor factory branch for demonstration. Thor Power Tool Co., Aurora, Ill.

THOR POWER TOOL COMPANY

COMPLETE RANGE OF SIZES

Thor Air Impact Wrenches are available in all six of the most-wanted sizes: Bolt size capacities include ¼", ⅜", ½", ¾", heavy duty ¾", and 1¼".

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Boston • Buffalo
Chicago • Cincinnati
Cleveland • Denver
Detroit • Houston
Los Angeles • Milwaukee
Newark • Long Island City, N.Y. • Philadelphia
Pittsburgh • St. Louis
San Francisco • Seattle
Toronto, Canada • Export Division, New York City

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE DECEMBER ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road and Builder	*No. of units*	*Horse-power*	*Service*	*Other detail*
FERNWOOD, COLUMBIA & GULF:				
Electro-Motive	1	900	Switching	Delivery April 1957.

FREIGHT-CAR ORDERS

Road and Builder	*No. of cars*	*Type*	*Cap., tons*	*Other detail*
ATCHISON, TOPEKA & SANTA FE:				
Pullman-Standard	950	Box	50	
	150	Box	50	Insulated
DULUTH, MISSABE & IRON RANGE:				
ACF Industries	500	Ore	70	For delivery third quarter 1957.
WESTERN MARYLAND:				
Bethlehem Steel	300	Hopper	70	Deliveries of 100 cars scheduled for June and July.
Greenville Steel Car	100	Covered hopper	70	

PASSENGER-CAR ORDERS

Road and Builder	*No. of cars*	*Type*	*Other detail*
BOSTON & MAINE:			
Budd	3	RDC-1	Estimated unit cost, $175,000. Delivery expected in April
CANADIAN NATIONAL:			
Budd	1	RDC-3	Deliveries of eight cars to be completed by June.
	3	RDC-1	
	4	RDC-4	

INQUIRIES AND NOTES

LOCOMOTIVES:

Chesapeake & Ohio.—Directors authorized purchase of 30 diesel-electric units. Cost, $5,700,000.

FREIGHT CARS:

Chesapeake & Ohio.—Plans to build a third experimental "Railvan" which will incorporate modifications suggested by service tests on two prototype units.

Erie.—Will purchase 50 specially equipped "Clejan" type flat cars for use in piggyback service at estimated cost of $560,000.

Rail-Trailer Company.—Requested bids for 200 75-ft flat cars for pooling service it provides to railroads participating in Trailer Train piggyback operations.

PASSENGER-TRAIN CARS:

Chicago & North Western.—Considering purchase of two lightweight, low-center-of-gravity units similar to "Train X" equipment.

Supply Trade Notes

Warren A. Thomas

Austin F. Murphy

GENERAL MOTORS CORPORATION, ELECTRO-MOTIVE DIVISION.—*Warren A. Thomas*, has been appointed district sales manager, Chicago region. *Austin F. Murphy*, assistant sales manager, succeeds Mr. Thomas as rebuild sales manager.

Mr. Thomas became an assembler in the locomotive division of Electro-Motive in 1936, and was subsequently foreman and service technician assigned to the United States Navy; manager of the Diesel Training Center at La Grane; manager of the statistics and market analysis section of the sales department; factory branch sales manager, and manager, of rebuild section, of the sales department.

Mr. Murphy became an operating instructor for Electro-Motive in February 1947 and has since been a service engineer, sales engineer, and assistant rebuild sales manager.

■

WYANDOTTE CHEMICALS CORPORATION.—*Harold R. Suter* has been appointed technical director of J. B. Ford Division of Wyandotte. He will coordinate activities of the division's research, technical service, manufacturing and engineering departments. *Maurice G. Kramer* continues as director of research, in charge of research laboratories. *John M. Daugherty* and *Bernard F. Schmitz* have joined Wyandotte's railroad sales staff, with headquarters in Minneapolis and in New England, respectively.

■

TIMKEN ROLLER BEARING COMPANY.—Timken mill begin construction of a new half million dollar metallurgical research laboratory next spring. To be located near the company's Steel and Tube Division offices in Canton, Ohio, the new building will centralize under one roof many of th emetallurgical research facilities now located in several separate buildings. The research program is in charge of *Dr. Daniel J. Giradi* and more than 75 metallurgical scientists will use the new research center when it is completed.

■

VANADIUM CORPORATION OF AMERICA.—*Harry E. Orr*, assistant vice-president and manager engineering sales, Chicago, has been appointed commercial vice-president in charge of engineering sales, Pittsburgh. *Raymond H. Filsinger*, district manager, Pittsburgh, has been named assistant vice-president, sales, New York, and *Howard H. Wilder*, manager of engineering sales, at Chicago.

■

EDGEWATER STEEL COMPANY.—Chicago district office has been moved to 80 East Jackson boulevard.

■

NICKEL CADMIUM BATTERY CORPORATION.—*Andreas J. Darlson* has been appointed eastern district manager at New York, succeeding *Melville E. Ingalls*, appointed special representative for sales to railroads.

■

SPRING PACKING CORPORATION.—*Randolph B. Cooke, Railroad Supply Company*, Baltimore, has been appointed representative in the sale of Spring Packing products to southeastern railroads.

■

NEW YORK AIR BRAKE COMPANY.—*Thomas W. Johnson* has been elected vice-president.

■

YOUNGSTOWN SHEET & TUBE CO.—*A. S. Glossbrenner*, vice-president of operations, has been elected president, succeeding *J. L. Mauthe*.

■

FROST PAINT & OIL CO.—*John D.* Ristine, formerly vice-president, Grip-Nut Company, Chicago, has become sales agent for Frost in the Chicago area.

■

K S M PRODUCTS.—*Anthony Maladra*, assistant sales manager, has been appointed sales manager, Stud Welding Division, Merchantville, N.J.

■

TEXAS COMPANY.—*R. J. Ronan* has been appointed regional manager—Technical Services, and *E. F. Koenig*, technical representative of the Technical Services Division, Research and Technical Department, both with headquarters at Beacon, N.Y.

■

SPEER CARBON COMPANY.—A new research and development laboratory is being constructed at Niagara Falls, N.Y.

(Turn to page 10)

Elastic Stop nuts were specified in 1949 to provide safety and low-cost fastening on the DL&W's famous Phoebe Snow.

Five years of high-speed passenger service confirms low maintenance cost of Elastic Stop® nuts

Holding fast despite vibration on shock absorber mountings . . . draft gear carriers . . . slack adjusters . . . brake cylinders . . . spring equalizer seats and pedestal tie bars, self-locking Elastic Stop nuts cut maintenance costs substantially on the DL&W modern Phoebe Snow passenger unit. Performing without failures for the past five years they eliminated the need for constant inspection and retightening. Easily removed without damage to bolt threads they can be re-used through many on-off cycles without loss of effectiveness.

Mail the coupon for detailed information on new, vibration-proof Elastic Stop nut fastening methods for locomotives, passenger and freight car applications.

ELASTIC STOP NUT CORPORATION OF AMERICA

ESNA TRADE MARK / ROLLPIN TRADEMARK

Elastic Stop Nut Corporation of America
Dept. N68-123, 2330 Vauxhall Road, Union, N. J.
Please send the following free fastening information:

☐ ELASTIC STOP nut bulletin

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name _____ Title _____

Firm _____

Street _____

City _____ Zone _____ State _____

SUPPLY TRADE NOTES

(Continued from page 8)

Dr. R. J. Rohr

MAGNUS CHEMICAL COMPANY.—*Dr. Robert J. Rohr* has been appointed midwest regional sales manager.

■

TURCO PRODUCTS, INC.—*Paul V. Rebel, Jr.*, has been appointed manager of the Cleveland sales district.

■

P. V. Rebel

C & D BATTERIES, INC.—*Charles N. Schuh, Jr.*, has joined the staff of Packaged Industrial Power, Inc., Jersey City, N.J., sales representatives of C & D in that area. *Clayton J. Roderick* of Gregory-Salisbury & Co., Inc., has been added to the sales staff of C & D in the Jackson, Miss., area. *Richard C. Garland* has joined Charles F. Gross Associates, Philadelphia sales representative of C & D.

■

AMERICAN HOIST PACIFIC COMPANY.—*American Hoist & Derrick Co.*, has expanded its operation to the West Coast and has formed a new corporation, American Hoist Pacific Company, at Seattle. *Charles D. Gould*, of that city, is vice-president and general manager of the new company.

(Continued on page 64)

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Item No.		Month of September		9 months ended with September	
		1956	1955	1956	1955
FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)					
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	3,964	6,000	35,335	48,555
3-06	Total, Diesel-electric	36,242	35,806	333,369	315,866
3-07	Total, electric	713	807	6,548	6,701
3-04	Total, locomotive-miles	41,193	42,847	377,423	373,093
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,716	1,737	15,124	14,872
4-06	Empty, total	892	911	8,405	8,187
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	9,838	13,968	87,570	112,349
6-02	Total in oil-burning steam locomotive trains	1,901	3,009	11,069	18,870
6-03	Total in Diesel-electric locomotive trains	107,664	103,143	960,353	894,113
6-04	Total in electric locomotive trains	2,311	2,411	20,317	20,409
6-06	Total in all trains	122,635	123,267	1,087,205	1,052,249
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.03	1.03	1.03	1.02
10-02	Loaded freight car-miles	44.8	43.6	43.0	42.8
10-03	Empty freight car-miles	23.3	22.9	23.9	23.6
10-04	Total freight car-miles (excluding caboose)	68.1	65.5	66.9	66.4
10-05	Gross ton-miles (excluding locomotive and tender)	3,200	3,095	3,092	3,028
10-06	Net ton-miles	1,503	1,435	1,416	1,372
12	Net ton-miles per loaded car-mile (M-211)	33.6	32.9	32.9	32.1
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	65.8	65.6	64.3	64.5
14	Averages per train hour (M-211):				
14-01	Train miles	18.4	18.3	18.6	18.7
14-02	Gross ton-miles (excluding locomotive and tender)	58,173	55,993	56,812	55,947
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	47.1	48.4	46.6	46.6
14-02	All	45.2	46.1	44.8	44.0
15	Average net ton-miles per freight car-day (M-240)	999	996	949	910
17	Per cent of home cars of total freight cars on the line (M-240)	40.4	41.1	41.9	46.4
PASSENGER SERVICE (DATA FROM I.C.C. M-213)					
3	Road motive-power miles (000):				
3-05	Steam	642	1,374	6,861	12,749
3-06	Diesel-electric	19,514	19,590	182,770	182,324
3-07	Electric	1,166	1,251	11,246	11,790
3-04	Total	21,322	22,215	200,878	206,869
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains:	223,176	229,971	2,081,180	2,116,324
4-09	Total in coal-burning steam locomotive trains	4,218	7,935	42,207	72,447
4-10	Total in oil-burning steam locomotive trains	935	4,093	13,767	38,397
4-11	Total in Diesel-electric locomotive trains:	203,913	203,398	1,890,945	1,870,514
12	Total car-miles per train-mile	9.99	9.92	9.92	9.83
YARD SERVICE (DATA FROM I.C.C. M-215)					
1	Freight yard switching locomotive-hours:				
1-01	Steam, coal-burning	218,314	319,039	2,088,245	2,532,224
1-02	Steam, oil-burning	29,804	55,377	278,502	434,376
1-03	Diesel-electric[1]	3,728,370	3,713,628	34,047,696	32,563,404
1-06	Total	3,980,359	4,094,527	36,446,262	35,589,038
2	Passenger yard switching hours:				
2-01	Steam, coal-burning	5,094	7,469	51,765	76,238
2-02	Steam, oil-burning	2,753	5,777	29,640	46,714
2-03	Diesel-electric[1]	240,050	237,443	2,222,722	2,191,151
2-06	Total	270,583	276,480	2,526,968	2,546,048
3	Hours per yard locomotive-day:				
3-01	Steam	6.8	7.0	6.2	5.6
3-02	Diesel-electric	15.6	16.0	15.7	15.6
3-05	Serviceable	15.6	15.7	15.7	15.3
3-06	All locomotives (serviceable, unserviceable and stored)	14.4	14.3	14.3	13.6
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.61	1.64	1.67	1.66
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.75	.74	.75	.74

[1] Excludes B and trailing A units

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
September, 1952	2,931,130	7,536	13,608	21,144	138,627
September, 1953	2,822,223	6,083	10,195	16,278	173,376
September 1954	2,614,432	6,740	8,882	15,622	167,355
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,793	363,197
April	2,787,705	3,471	6,485	9,956	280,002
May	2,931,850	4,860	8,664	13,524	216,788
June	2,945,955	6,080	10,226	16,306	180,666
July	2,906,558	8,086	13,635	21,721	133,813
August	2,954,439	8,555	14,358	22,913	128,941
September	2,923,592	5,896	10,469	16,365	178,649
October	3,025,177	3,966	7,182	11,148	271,364
November	2,950,228	2,010	3,972	5,982	493,184
December	2,922,034	1,819	3,774	5,593	522,444
1956					
January	2,925,109	2,029	4,302	6,331	462,029
February	2,794,161	2,570	5,611	8,181	341,542
March	3,027,684	2,517	6,212	8,729	346,853
April	2,930,389	3,202	6,881	10,083	290,626
May	3,063,427	4,672	10,903	15,575	196,688
June	2,973,732	6,777	15,125	21,902	135,774
July	2,788,347	8,484	16,067	24,551	113,573
August	3,039,173	9,891	16,892	26,783	113,474
September	2,918,875	6,834	12,629	19,463	149,970

this can be prevented.....

with *Statite*

and only USG® brushes have STATITE® permanent shunt connections

If you are having trouble with shunts jarring loose or being pulled out, we suggest you try USG Brushes with Statite. Statite is a permanent shunt connection needing no hammerclips. It can't be jarred out even under severe operating conditions, and will assure your electric motors of steady maintenance-free performance. Statite eliminates the need for riveted shunt connections. In addition, Statite shunt connections retain their original low millivolt shunt drop, cannot oxidize, and are unaffected by temperature extremes. USG Brushes are manufactured in a variety of types and sizes for all applications from fractional horsepower to diesel generator. Grades available include carbon and carbon-graphite, electrographitic, graphite, metal graphite, and silver graphite.

224

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

THE UNITED STATES GRAPHITE COMPANY
SAGINAW, MICHIGAN

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

Plastic for Drop Windows

Plastic glazing is saving the Pennsylvania $3,500 a year in replacement costs by eliminating breakage of the motorman's drop side-window in suburban multiple-unit cars.

This 2- x 2½-ft glass window was especially vulnerable to breakage. To open, the motorman lowered it into a pocket about 30 in. deep. If he released it prematurely or if it slipped from his hand, the bottoming impact invariably shattered the pane. At the Paoli car shop, where these multiple-units are serviced, it was estimated that the breakage rate for these windows ran approximately 100 per cent annually on all drop windows. Replacement cost, including labor, exceeded $3,500 a year. This recurrent expense did not include sizeable claims for personal injury.

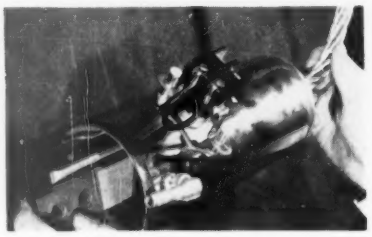
To stop this loss the railroad has been replacing the glass with ⅛-in. thick Plexiglas, a shatter-resistant acrylic plastic. To date nearly every mu drop window has been refitted with this plastic. No breakage has occurred; no injury claims have been filed.

Other advantages of the acrylic plastic are weight reduction and the resilience needed if the pane is mounted in an occasional warped sash. Glass under identical stress invariably breaks from vibration alone.

This material is purchased in large sheets, sawed to size, and stacked with the protective masking intact until needed. To allow for expansion with temperature change in service, they are cut slightly undersize. It is installed in two steps. First a semi-soft sealing compound, purchased in the form of continuous strip 1-in. wide, is placed along the edge of the pane and then folded down on each side to form a channel. The pane and the sealer can then be placed in the sash in a single operation, after which the beading is put in place. The manufacturers report that this strip sealing compound maintains its consistency despite exposure to weather and frequent washing with detergents which extract the oils from conventional putty.

All car windows are washed every third day by mechanical washer, using a solution of oxalic acid in water to remove road grime. Pumice and stiff brushes should not be used on this material.

Another breakage problem, less costly but no less a nuisance, has been in the protective window in the 6- x 9-in. metal holders containing the monthly ICC and railroad inspection forms in locomotives and multiple-unit cars. The holders were occasionally dropped. By using Plexiglas, recurrent breakage has been eliminated here as well. *Rohm & Haas Co., Dept. RLC, 712 Locust st., Philadelphia.*

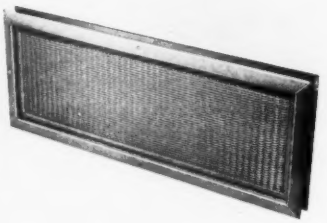


Ignitron Tube

This tube, WL-5822-A, is capable of intermittent ignitor service for the control of frequency-changer resistance welders. It replaces the WL-5822. It is sealed and stainless-steel jacketed and has a 1200 or 1500 volt maximum anode voltage rating with 1500 or 1200 amp maximum anode current.

The mercury-pool tube provides for thermostatic control and, when equipped with proper switches, conserves cooling water consumption and protects it and associated equipment from overloads and overheating.

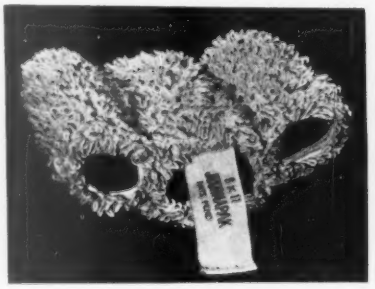
Overall length, including leads, is 25 in.; diameter, 4¼ in., and net weight, 8¼ lb. *Westinghouse Electric Corporation, Electronic Tube Division, Dept. RLC, Box 284, Elmira, N.Y.*

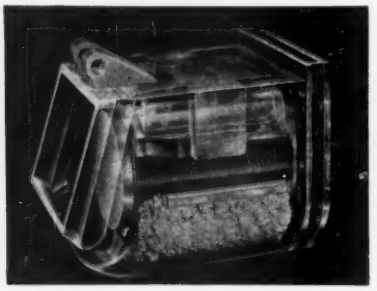


Door Grille

The Uni-Flo Model ED, door grille is available with two cores. One, vision-proof from any angle, has a free area of 81.5 per cent; the other has a free area of 86.6 per cent. Special baked enamel

(Continued on page 14)



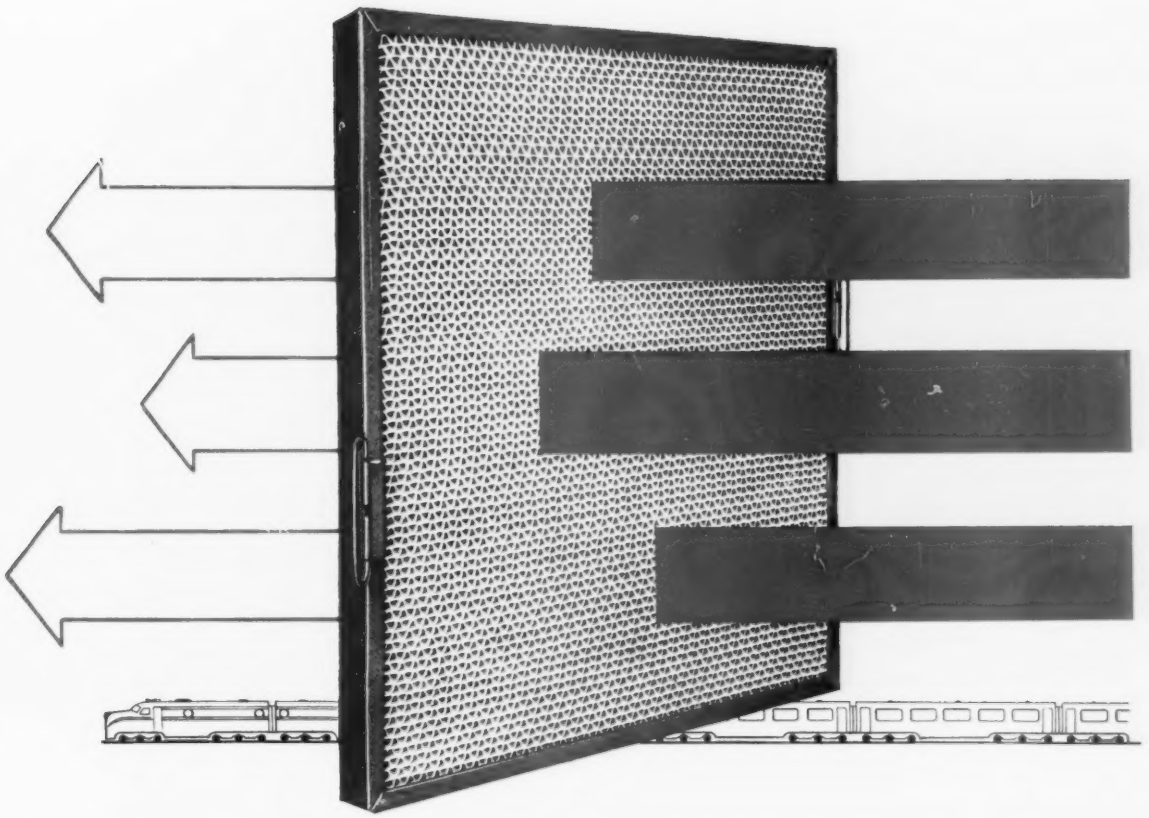


Journal Lubricator

Called "Journapak," this journal lubricator is AAR approved for interchange operation and is available in sizes for any standard axle, according to its manufacturers. Pad has no hardware or mechanical parts; no drilling or modification is necessary when used in standard boxes.

Consisting of three oil-resistant Neoprene cushions separated from each other, these cushions, in turn, are surrounded by a tufted cotton yarn overcoat. Together these form a flexible, reversible unit that can be positioned without tools and removed by a pull-strap.

This lubricator is said to work on the principle of feeding oil both up around the sections and up through the yarn tufting between the sections. Accordingly, only clean oil reaches the journal, the entire unit acting as both a reservoir for the oil and a filter. *Security Railway Products Co., Dept. RLC, 120 So. La Salle st., Chicago 3.*



Cut maintenance, increase engine life with Esso AIRFIL® Coating Oil

Esso's new AIRFIL Coating Oil for diesel engine air filters has such great dirt pick-up qualities that it can substantially cut maintenance costs and increase engine life. This is possible because of the reduction in abrasive wear, lessening the need for replacements of engine parts. You, too, can profit from these benefits by using Esso AIRFIL Coating Oil in diesel air intake filters, and in air-conditioning filters.

Esso AIRFIL COATING OIL offers three important advantages:

1. Easy to apply... won't drip off. In liquid form when hot, it may be applied quickly in the desired quantity, while at normal temperatures, it is a gel-like solid that won't run off.

2. Superior wicking qualities mean a continually fresh surface is presented to the air. Successive layers of dust are rapidly wetted, keeping dirt-retaining efficiency at a maximum.

3. Insoluble in water . . . won't emulsify, and so resists removal by rain or snow, yet it can be removed quickly by hot detergent wash or steam blast.

Esso

RAILROAD PRODUCTS

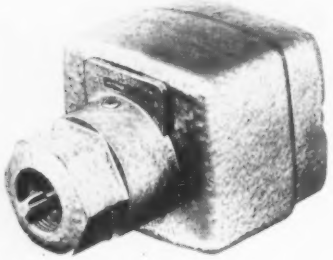
Esso offers a complete line of dependable railroad products. Valuable years of experience in research and development, combined with continual testing on the road and in the lab, stand back of the outstanding performance of Esso Railroad products.

For data sheet regarding specifications of AIRFIL Coating Oil, write to Esso Standard Oil Company, Railroad Sales Division, 15 West 51st Street, New York 19, N. Y.

EQUIPMENT . . NEW IDEAS . . NEW USES

finishes are available to match any color in addition to several standard finishes.

A telescoping frame provides a 1-in. flange for both sides of the door. The grille can be used in doors from 1⅜ to 2 in. thick. *Dept. 760, Barber-Colman Company, Dept. RLC, Rockford, Ill.*



Tachometer Takeoff Head

Available with AN screw mounts for aircraft tachometer takeoffs, and with SAE screw mounts for gasoline, diesel, railway or stationary engines or compressors, these Series 34 units, when used with the manufacturer's indicators, measure speeds between 100 and 5000 rpm. No brushes, slip rings or other parts requiring replacement are used.

A double-pole, double-throw switch with a capacitor senses speed when the take-off shaft rotates in either direction. It can also transmit a linear current, with respect to speed of the indicator, up to 1,000 ft away. Either one of two stainless-steel keyed shafts are standard. Also, it is available with two alternate shafts—$\frac{5}{16}$ in. round and ¼ in. square. Ball bearings are ⅝ in. outside diameter. *Metron Instrument Company, Dept. RLC, 432 Lincoln street, Denver 9, Colo.*

Electric Truck Battery

These Super Dreadnaught batteries for electric industrial trucks are available in 3 sizes—the 40 amp-hr positive plate for standard height; the 60 amp-hr positive plate for high-type; and the 120 amp-hr positive plate for extra-high batteries.

The grid of its basic Z construction has been designed for maximum strength. It is non-porous and dense as a result of solidification during casting. Active battery material is regenerative oxide. Plate packs are wrapped in perforated plastic envelopes that permit free electrolyte circulation.

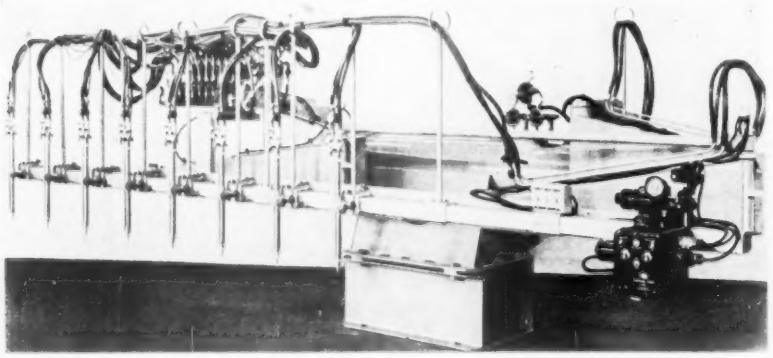
Separators, of micro-porous rubber, have their back web 30 per cent thicker. Ribs are 30 per cent higher and over-all thickness is 30 per cent greater than ordinary separators. Retainers of spun glass form a dense mat that is ½ in. thick and highly porous. *Gould-National Batteries, Inc., Dept. RLC, Trenton, N.J.*

Gas Shape Cutting Machine

This medium area oxyacetylene shape cutting machine, the Airco No. 56 Oxygraph, carries automatic cutting equipment motorized cutting torch holders, solenoid gas distribution system, and the electronic tracer—all remotely controlled. The oxygraph can carry automatic electronic welding equipment as well.

A stationary type with a fixed cutting area (56-in. diameter circle), it can be converted to a larger area, unlimited length machine by adding rails and a traveling carriage. Electronic, manual and magnetic tracers may be used. The basic machine consists of the pantograph arms, the operating bar upon which the torches and tracer are mounted, and a welded pedestal for floor mounting.

The machine is of all-welded steel construction; has pantograph arms of box-girder design; large diameter ball bearings in pantograph arm hinges and operating bar assembly; an electrically operated solenoid controlled gas distribution system, and a panel with accessory outlets. *Air Reduction Sales Company, Dept. RLC, 150 East 42nd street, New York 17.*



Steam Cleaner

A steady jet of steam at 120 lb pressure for cleaning heavy railroad and industrial equipment is produced in this Model 45 cleaner. It consumes only 1¼ gal of No. 1 fuel-oil per hour to turn 45 gal of water per hour into a steam cleaning jet. The gun can mix a concentrated alkaline with the steam to cut through grease packed dirt. Then the concentrate may be turned off to rinse the piece with clean steam, ready for painting.

A ⅓ hp 110 volt motor, with an overload cut off, drives the positive displacement water pump. The steam is formed in coils which are heated by forced draft fuel oil or city gas fuel fire. A float-control maintains the water supply. Fuel oil capacity provides 4 hr of steady steam cleaning. The safety valve is set at 175 psi.

Complete with cleaning gun, 16 ft of wire-braided steam hose and cleaning solution hose, unit is ready to operate by making service connections. Although standard model has no wheels, a three wheel kit is available. *Dept. PR-56, Vapor Heating Corp., Dept. RLC, 80 East Jackson Blvd., Chicago 4.*

Welding Electrode

The Strikeasy 610 is a mild steel arc welding electrode developed with an iron powder coating. It is recommended for use in field construction, including pipelines, car fabrication, and pressure pipe welding, where high quality deposits are required.

Adding iron powder to the electrode coating is said to have improved weld quality, particularly in root passes, because of the reduction in size of the 'wagon tracks' usually formed in mild steel welding. The iron powder coating is said to eliminate slag interference in confined joints or vertical down welding, making these electrodes suitable for tank fabrication, steel casting repair, etc.

According to the engineers, this coating provides a more stable arc. The fast freezing deposit wets and spreads readily as it is applied, reducing the effort necessary to

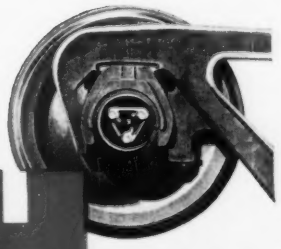
Another GM GENERAL MOTORS contribution to railroad progress

Why your freight arrives earlier than ever before

ONE REASON IS PUSH-BUTTON YARDS which save hours in making up trains. As cars roll down the "hump," a finger-flick guides them through a maze of switches to the proper track. Meanwhile radar and electronic computers evaluate "rollability" (even wind resistance) —automatically actuate retarders which slow the wheels, so each car will roll just far enough to couple gently!

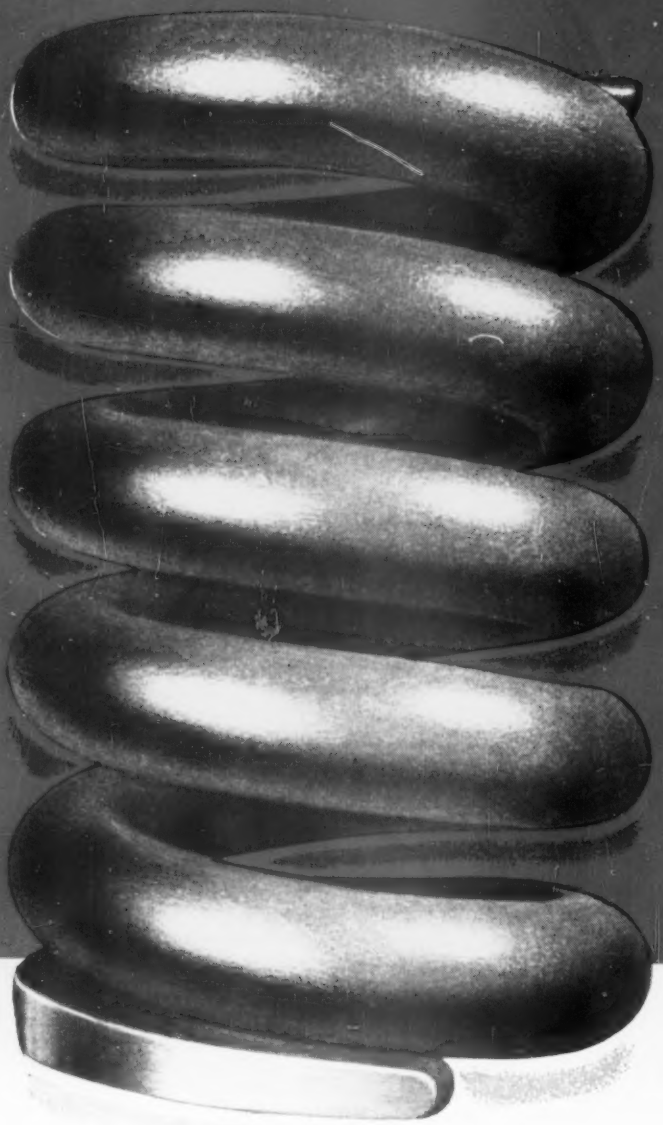
ANOTHER BIG REASON IS HYATT HY-ROLL BEARINGS for non-stop freight. The first cost and upkeep of this new simplified design is so low that railroads can now equip whole fleets of freight cars with roller bearings. Hy-Rolls are eliminating hotbox, lubrication and inspection delays—let freight trains roll on passenger schedules. Husky *straight cylindrical rollers* give HYATT Hy-Rolls greater load capacity—make them easier to install and maintain. No wonder the big switch is to HYATT Hy-Rolls—*the best bearing for the long haul!* Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

Watch "WIDE WIDE WORLD" Sundays on NBC-TV



HYATT HY-ROLL BEARINGS
FOR NON-STOP FREIGHT

LOOK AT



1.

Longer Service Life

All ASF Extended Life Springs are shot-peened—which cold-works surfaces and more than doubles the life of the spring.

ASF

ALL THREE

...before you specify truck springs!

2. Better Performance

A new heat-treating process makes ASF Extended Life Springs far better able to maintain load-carrying capacity—without permanent set.

3. Lower Cost

ASF Extended Life Springs are now available at no increase in cost over conventional springs. Because they last over twice as long, they cut your spring costs per car mile.

E-X-T-E-N-D-E-D L-I-F-E SPRINGS

A contribution to railroad progress...through research by

AMERICAN STEEL FOUNDRIES

Prudential Plaza, Chicago 1, Illinois

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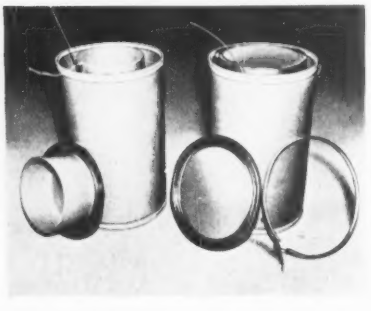
EQUIPMENT . . NEW IDEAS . . NEW USES

control undercut, weld shape and size. *Welding Dept., General Electric, Dept. RLC, Schenectady 5, N. Y.*

Powered Threading

The 4PJ, a 2½ to 4-in. geared pipe threader, is now equipped with an automatic drive kick-out to make it jamproof. This model is said to make threading with power drives as safe as by hand. Die stock and power drive no longer have to be watched while threading.

After each standard length thread is cut, the drive pinion kicks out automatically and prevents jamming. Gears are fully enclosed and there are no bushings to contend with. An easy-to-set workholder is included with the geared threader. *Ridge Tool Co., Dept. RLC, Elyria, Ohio.*



Welding Wire Dispenser

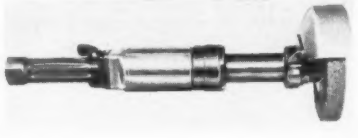
These Payoffpaks for dispensing automatic welding wire are light in weight and protect the wire contents against coil distortion or corrosion. The dispenser offers the advantages of continuous welding up to 500 lb of deposited weld metal with no down-time or replacing of small coils or reels. According to the manufacturer, the wire feeds steadily from the container, giving uniformity of feed which is essential for submerged arc or inert gas automatic welding.

Welding wire, in size from ⅛ in. to 0.030 in., is available in the package dispenser. They include all analyses from Armco Pure Iron up to 1.10 carbon steel and in low-alloy types and specialties. *Page Steel & Wire Division, American Chain & Cable Co., Dept. RLC, Monessen, Pa.*

Way Wipers

The C/R way wiper is quickly installed on milling machines, shapers, grinders, planers, gear cutters, hydraulic rams, etc., providing protection wherever metal parts slide over ways in close alignment. It wipes the ways clean of all dirt, chips, abrasives, cutting compounds and water emulsions and leaves a thin protective oil film.

The wipers are made in four types, each incorporating a basic synthetic rubber wiping member. Type A is spring-loaded and is enclosed in a metal case. Type B has a metal strip bonded to the rubber. Type C is of plain rubber while type D employs a bonded finger spring. All types are 22 in. long and are easily cut to required lengths. *Sirvene Division, Chicago Rawhide Manufacturing Company, Dept. RLC, 1267 Elston avenue, Chicago 22.*



Air Grinder

A lightweight 6-in. air grinder, with a motor reported 50 per cent more powerful than previous models, is being produced in 12 models—four different speeds and three different throttle types. It has a five-blade type motor with a one-piece rotor and shaft and is available in speeds of 4,500, 6,000, 9,000 and 12,000 rpm. This tool is stocked in butterfly, grip and lever type throttles. The newly designed governor is a unit assembly, direct acting and tamper-proof with an adjustable governor spring.

The 4GG series grip type has a handle integral with the cylinder housing and a steel ball throttle valve. The 4GL series lever throttle handle is made of aluminum with a rubber sleeve. The 4GB series button or butterfly type has an aluminum handle with longitudinal ridgings. Throttle valve seats in steel bushings are made of stainless steel to prevent rusting. All throttle types have a steel reducer bushing for hose connections. The grip type also has an automatic mist type lubricator. *Thor Power Tool Co., Dept. RLC, Aurora, Ill.*

Emergency Lighting

An emergency lighting unit, which not only operates automatically during power failures, but also resets itself is announced. Called a Model A Exide Lightguard, it is said to provide more blackout protection than other types because of an automatic charging device.

Immediately following an emergency discharge, the unit recharges its storage batteries at a high rate. After the high rate charge, it returns the batteries to a trickle rate to maintain itself in constant readiness. A relay eliminates the need for a charge-rate switch, which would require manual operation.

This unit will illuminate one 25-watt sealed-beam lamp for eight hours, two 25's for over three hours, or three such lamps for one and a half hours. Batteries are encased in molded, transparent plastic and the case of this model is 20-guage steel. Finish is baked gray hammertone enamel and the unit, with one lamp mounted on the case, weighs 37 lbs *Exide Industrial Div., The Electric Stor age Battery Co., Dept AL—RLC, Box 8109, Philadelphia 1.*

Bonding Rubber to Metal

The Duolock system combines a primer with appropriate tie coats. It may be used on motor mounts, industrial tires, rubber covered rolls, or wherever natural or synthetic rubber is bonded to metal.

It is said that good bonds may be obtained over a wide range of curing conditions such as long low temperature cures or short high temperature cures. Its standard tie coats will do the job, although special tie coats can be developed for volume requirements.

Duolock primer is a free flowing, single phase, black liquid supplied at a viscosity

(*Continued on page 70*)

ASSOCIATION
OF AMERICAN
RAILROADS

Rx

Prescription

Must be of material to specification

Must be cast and fitted to close tolerances

Must have complete interchangeability of all parts

Must be sold at a reasonable price

NATIONAL
MALLEABLE AND STEEL
CASTINGS COMPANY
CLEVELAND 6, OHIO

A standard coupler was needed

Small freight cars or large, small locomotives or mighty, all would be useless without some way to join them together; thus, we find the history of the present day automatic coupler most interesting. Many years have passed since the link and pin, the Miller Hook and the first coupler of Eli Janney.

So frightful were the accidents of coupling and uncoupling with the old link and pin method that in 1893 Congress passed the Safety Appliance Act, which made it mandatory that after January 1, 1898, all cars used in interstate commerce must be equipped with couplers which would couple automatically on impact, and uncouple without a man stepping between the cars.

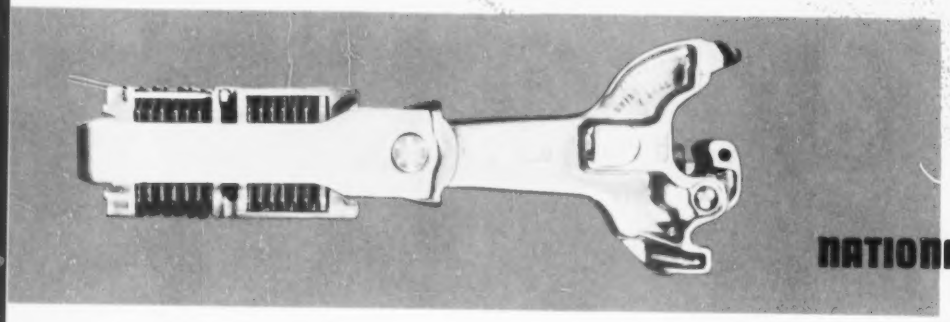
While the federal statute saved countless limbs and lives, yet it posed for the railroads a tremendous problem, in that soon there were over 100 different types of couplers, knuckles, locks, and parts.

Finally, in 1916, the Type "D" Coupler was adopted as standard for railroads of the United States, Canada and Mexico. With the adoption of a standard coupler it soon became evident that a set of specifications would be necessary to control material, tolerances and so forth. In 1918, the Association of American Railroads set up the first specifications on the manufacture and inspection of couplers.

A comprehensive inspection and gauging program, to assure the railroads the highest quality couplers, is conducted by the coupler manufacturers in accordance with the A.A.R. specifications. Also, the coupler manufacturers periodically engage jointly in an extensive program consisting of complete inspection, gauging, interchange and testing of "E", "F" and "H" couplers.

These A.A.R. specifications, revised and expanded from time to time, require a total of 133 gauges for the three couplers — "E", "F" and "H" — covering 563 gauging points.

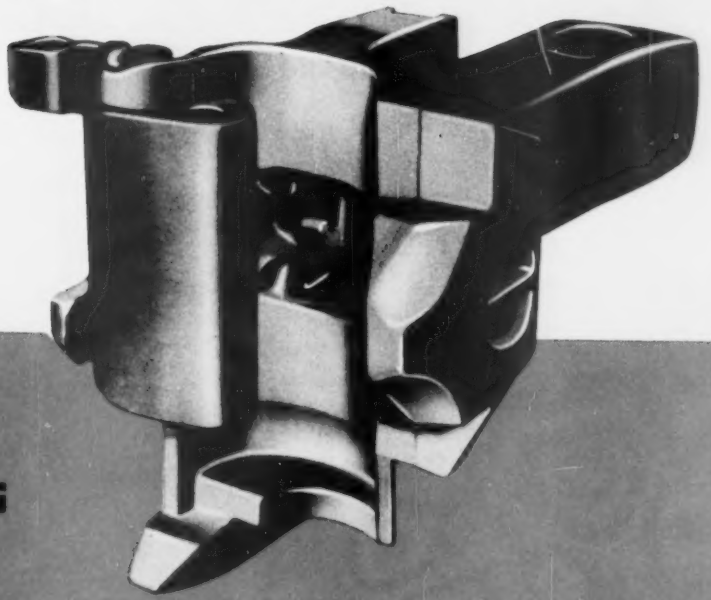
National is proud to have played, and to continue to play, an important part in the development of modern railroad couplers, and will continue to more than follow the inspection and gauging specifications set down by the Association of American Railroads.



NATIONAL DRAW GEAR ASSEMBLY

with National MF-400 Rubber-Cushioned Draft Gear

50 GAUGES
214 GAUGING POINTS



TYPE "F" INTERLOCKING COUPLER

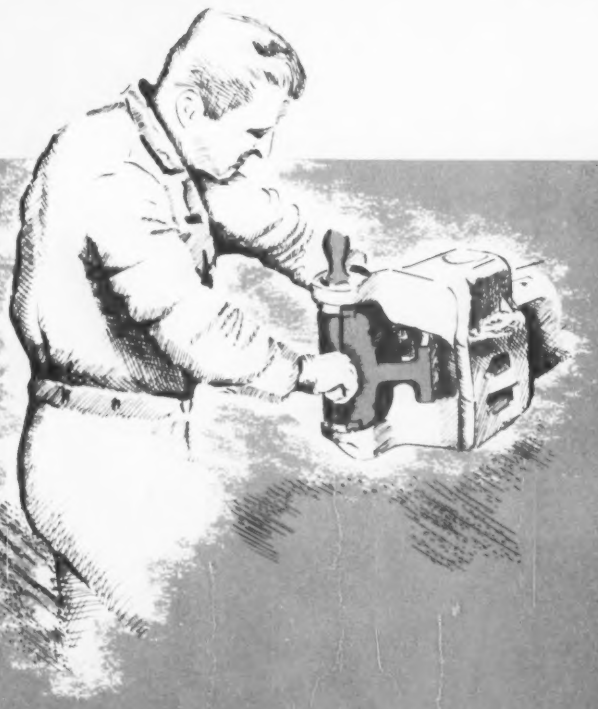
The Type "F" coupler reduces the free slack between knuckles to about 50 per cent of that in the "E". It is also stronger than the type "E" and has interlocking wings for alignment. Another safety factor is the centrally located shelf on the lower front face which serves to support a conventional type coupler in event of a pull out.

National, with over 65 years experience in coupler design and manufacture, contributed heavily to the development of the Type "F" coupler. This coupler was designed for freight service at the request of the railroads after the Type "H" Tightlock coupler proved so successful in passenger service.

STANDARD "E" COUPLER

47
GAUGE

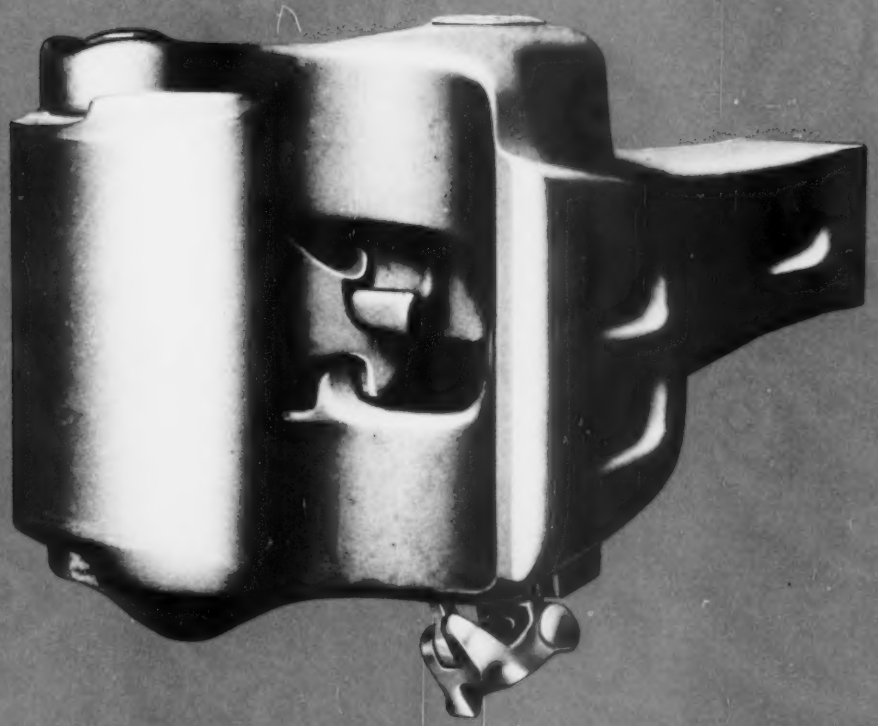
18
GAUGI
POINT



Illustrated above are the 47 gauges used on the "E" coupler. Shown on this page are two of the numerous gauging operations which all National "E" couplers must pass before shipment to railroads.

7
GES

32
GING
ITS



The A.A.R. Standard Type E-60 coupler, proud successor to the Type "D" coupler, became standard in 1932. It is made of Grade B steel with high tensile steel knuckle and lock. A set of manufacturing gauges for this type of coupler costs approximately $14,000. with several sets required for quantity production (A set of master gauges required for making and checking the manufacturing gauges costs $12,000.). This type of coupler is also produced in high tensile steel.

The high tensile steel knuckle is purposely designed to be somewhat weaker than the body of the coupler or attachments. In other words, it is the "safety valve" used to protect the more expensive and less readily replaceable parts of the draft system.

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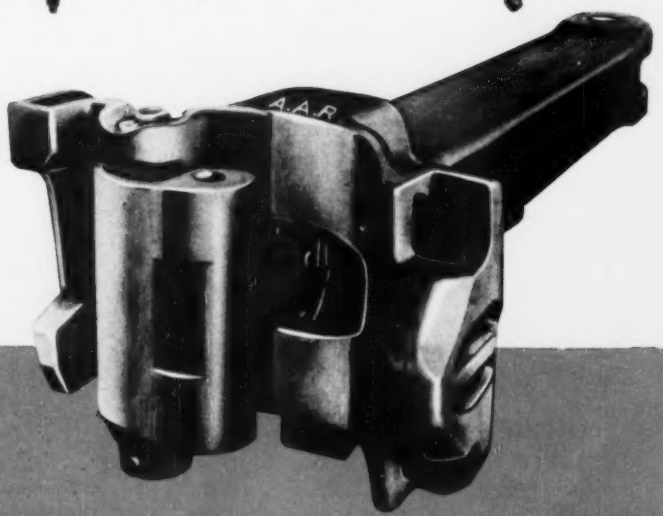

TYPE "H" TIGHTLOCK COUPLER

36 GAUGES

167 GAUGING POINTS

10 MACHINING OPERATIONS TO CLOSE TOLERANCES

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National is proud to have been the largest contributor to the development of this coupler.

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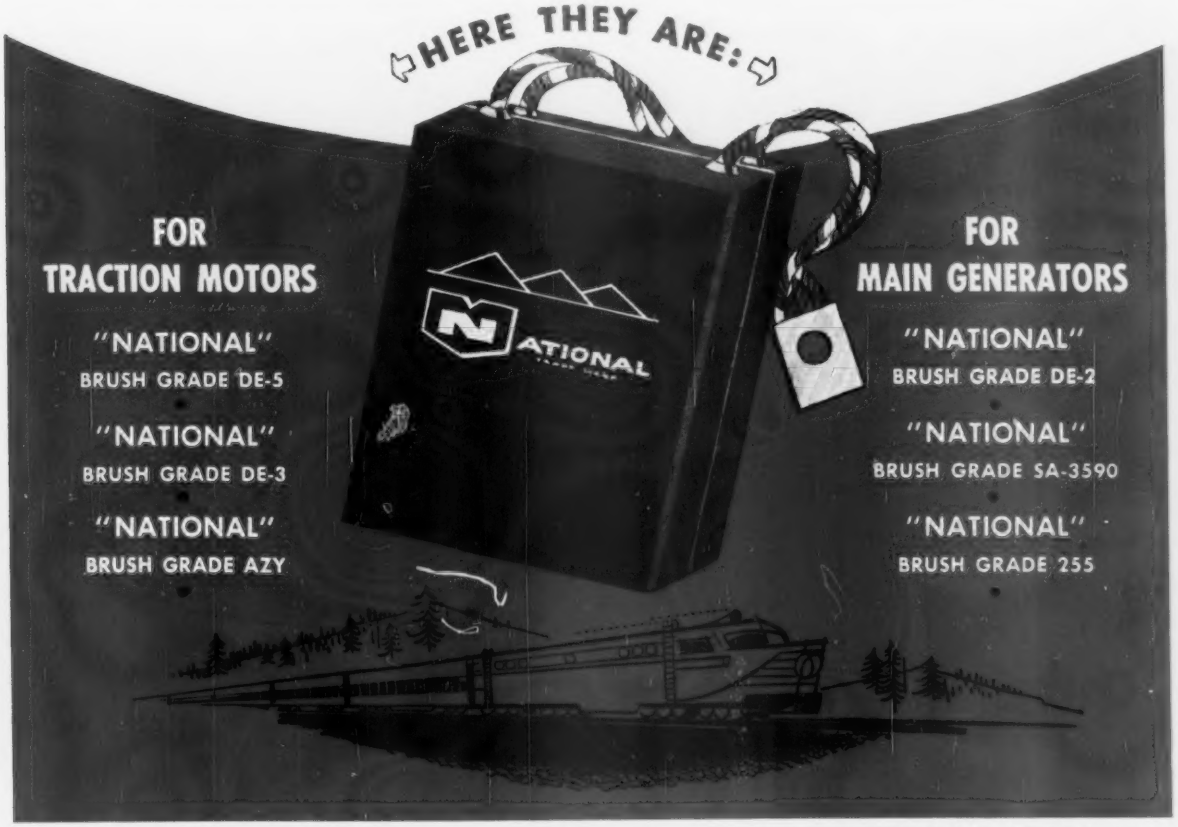

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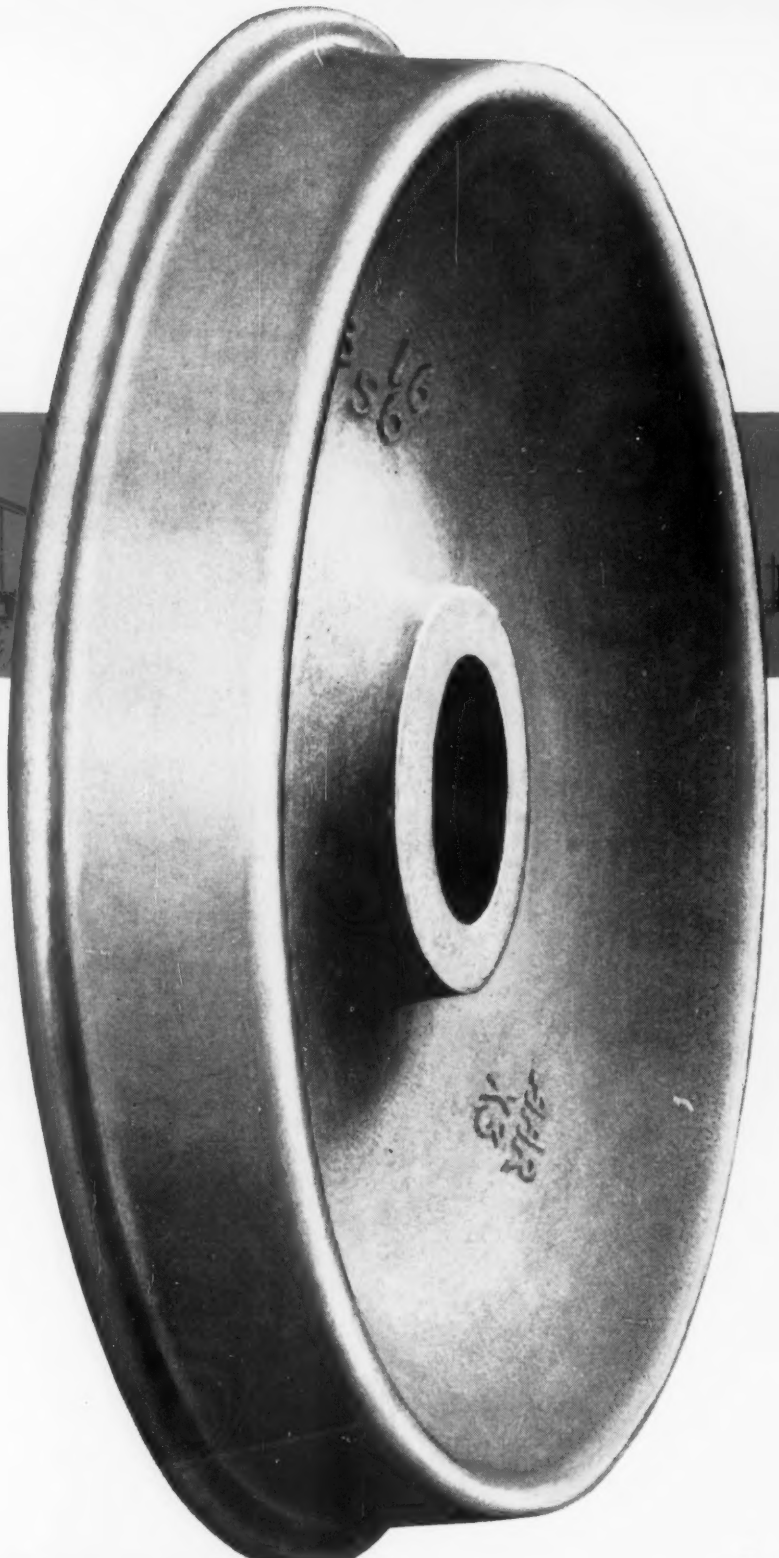
Griffin EQS is placed in service under all types of cars and performance is so outstanding that the railroads move to adopt it as standard.



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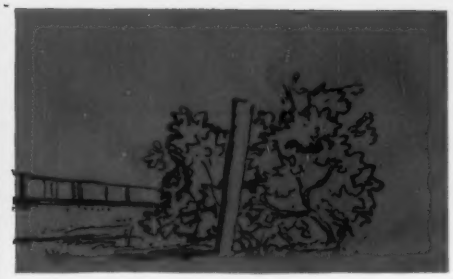

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You'll find these, as well as the rest of the complete line of Adlake hardware, in good taste, of top quality and, therefore, most economical in service. Write us, today, for our catalog on hardware for railroad cars. No obligation, of course. Address: 1152 N. Michigan, Elkhart, Indiana.

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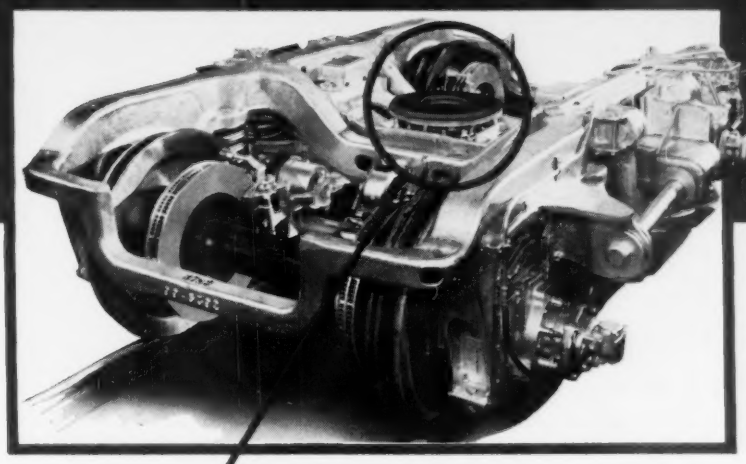

provide
a more comfortable ride
and increase your revenue

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- **eliminate lateral shimmy**
- **increase wheel mileage**
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for existing or new equipment

Now . . . a dynamic development that goes after increased revenue with the benefits rail passengers are looking for! Passengers buy *comfort* . . . and you can give them more of it with *Central Bearings.*

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MODEL	T-10	T-14	T-15	T-30-2	T-30-6
Diameter — in. nom.	9	11.5	15.25	15.25	16
Length — in.	9	14.12	16.75	17.25	21.75
Weight — lb.	40	95	125	135	195
Output — lb/min. (Standard Conditions)	25-40	35-65	35-65	70-95	115-175

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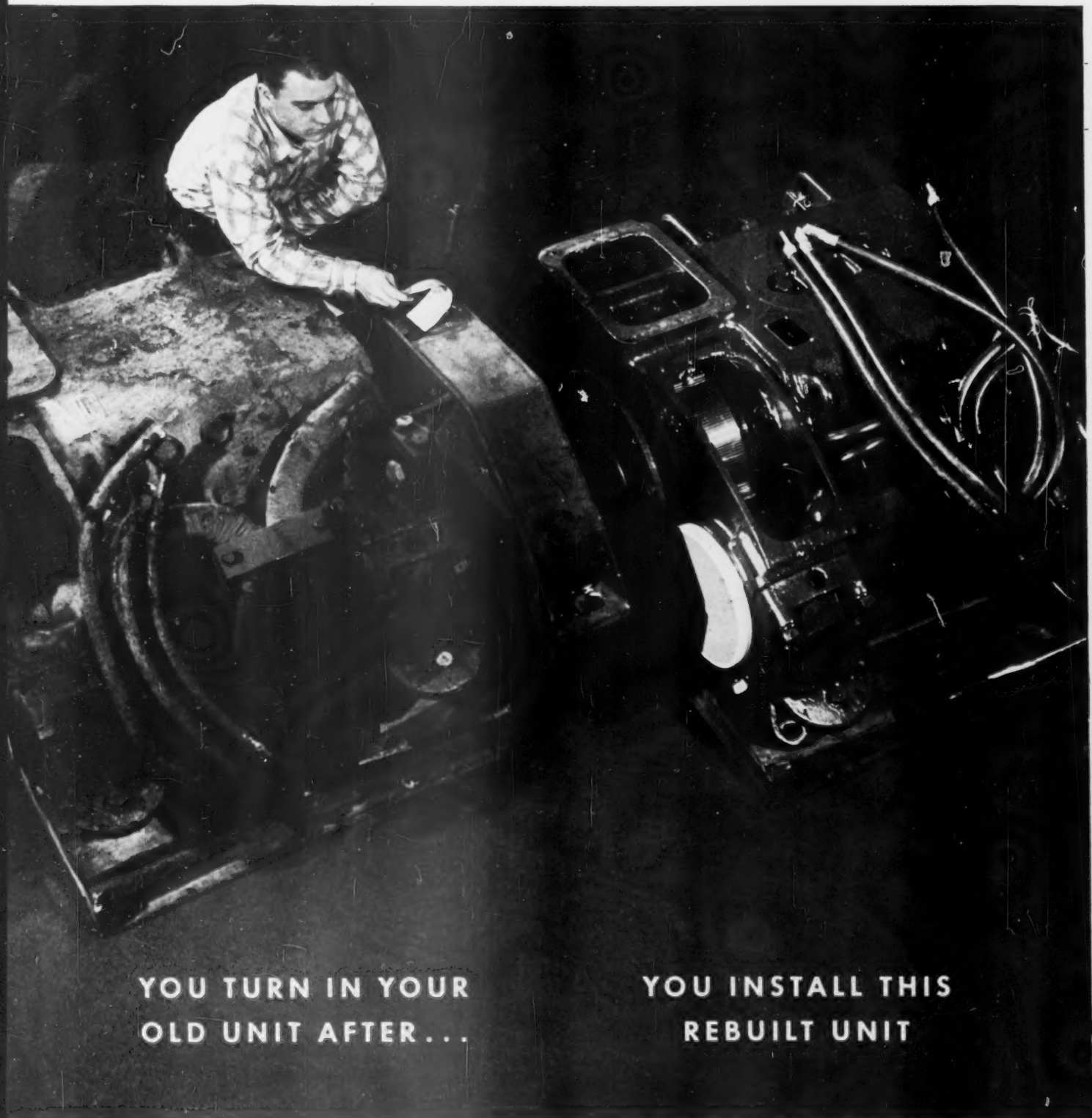
How General Electric's Unit Exchange



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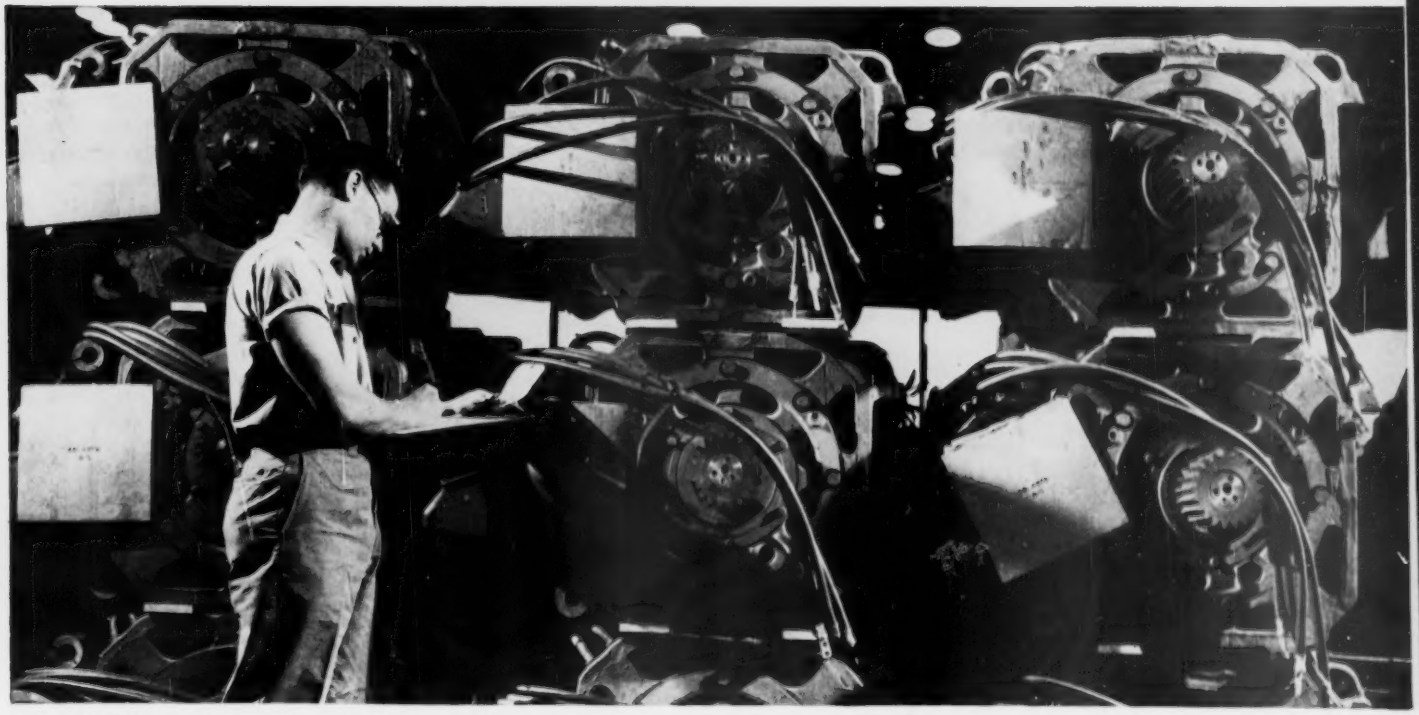


ALL EXCHANGE UNITS are disassembled for detailed inspection and complete reconditioning before they are returned to the exchange pool for future use. That's why each component reconditioned by General Electric has a new-part warranty.

How R-S JOURNAL STOPS will further Reduce Solid Bearing Operating Costs

and pay for themselves in less than 3 years!

Tests have proved that this new device will greatly improve bearing performance and journal lubrication, will at least double bearing life, reduce wheel flange wear and make other significant savings in freight car operation.

STABILIZE the solid bearing assembly and you approach the maximum in bearing performance. You do just that with R-S Journal Stops. Best of all, they pay for themselves in less than 3 years. Here's how:

First, you reduce routine yard servicing and oiling requirements. Packing seldom needs adjustment, and you don't need oil so often either. (Other lubricators, pad or mechanical, will benefit, too). You cut car oilers' time in half, and inspectors' time by as much as 25%. When enough cars are Journal Stop equipped that could mean savings close to $18.00 per car per year.*

Second, all indications point to 3-year periods between periodic attention as required by Rule 66. That would cut current costs in half — save as much as $6.00 per car per year.

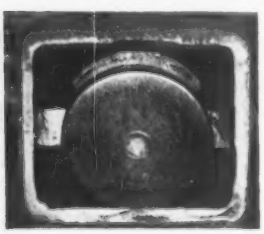
Third, and conservatively, you'll reduce road repair costs to a third of what they now are — possibly a great deal more. That means minimum savings of $6.00 per car per year.

Fourth, you'll cut bearing consumption in half — use less than 1½ bearings per car per year. In annual savings that will mean about $4.00 per car.

The above four items alone represent potential annual savings of $34.00 per car. Add to these the tremendous savings due to reduced wheel flange wear and a 3-year recovery estimate is probably conservative.

One private car company whose total savings are determined largely by billings that don't cover servicing costs, has already estimated recovery of total installation costs in less than 3 years. Operating roads will save even more. Write us today for full information. Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.

**These and other estimated savings are based on unbiased studies of AAR solid journal bearing operating costs.*



Unretouched photo of the RS Journal Stop installation with conventional waste packing. Other lubricators are similarly "contained."

MAGNUS

Solid Bearings

MAGNUS METAL CORPORATION

Subsidiary of **NATIONAL LEAD COMPANY**

RAILWAY LOCOMOTIVES AND CARS

Modern Cars Use Plywood

...for a variety of applications, both interior and exterior. Plywood has some disadvantages—most of which can be overcome by proper techniques

Today there are some 50,000 all or part plywood freight cars in service on 25 U.S. roads, in which plywood is used either as an internal or external construction material. It has been tried out from time to time on different roads with varying degrees of success since it was first applied in 1936 as a ½-in. ceiling for box cars, and shortly thereafter to the interior sides and ends of 1,000 furniture cars. Currently the principal uses of plywood for rolling stock appear to be in five general categories:

1—Box car lining and relining
2—Interiors of refrigerator cars
3—Freight car sheathing renewal
4—Caboose and camp car rehabilitation
5—Passenger car interiors

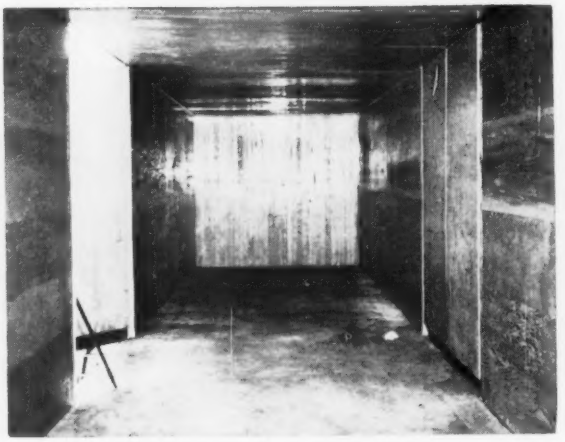
Cost is not a governing factor in comparing plywood against tongue and groove (T-G) lumber for either inside lining or outside sheathing. The extra cost of buying plywood is just about made up by the saving in labor to apply it. Material cost may run half again as much as with other lumber, but the reduction in application cost about cancels this increase out.

On one repair program where plywood was used on both the inside and outside, the cost per car ran around $127. This was $10.00 more than conventional tongue and groove siding, but the labor cost for application was $8.00 less—a net

Exterior grade ⅝-in. fir plywood was used both for interior lining and exterior sheathing on 1,000 Great Northern box cars in a rebuilding program.

Interior of one of the Great Northern box cars after completion shown while the lining is being treated with a spray coat which is a moisture repellent.

Cars rehabilitated by the Frisco for handling only foodstuffs have a number of features to protect bagged commodities, including plywood side lining, smooth-finished flooring, and rounded-off door posts.



"Cookie Box" cars on the D&RGW built specially to keep bakery goods fresh and painted white on the outside have ¼-in. plywood in the sides and ceilngs and ½-in. plywood for the lining of the doors.

increase of only $2.00 (The actual difference amounted to a little more than this $2.00 because some additional lumber had to be used to revise the framing to convert the car exterior from conventional lumber to plywood, but the total was still in the $5-$10 range).

Since the total initial cost of plywood, considering both materials and labor, is not substantially higher than conventional T-G lumber there must be other factors not readily apparent that to be weighed in deciding for or against plywood. Based on results on 11 railroads, here is an evaluation of the advantages and disadvantages of plywood in different services.

Nailing a Major Problem

The inability to stand nails is one of plywood's principal problems. In regular lumber, nail holes tend to close up when the nail is removed, especially where the lumber is under compression like the lining of a box car. Not so with plywood—when a nail is removed the hole remains. Thus bulk commodities can leak through the hole and out of the car. In some cases moisture will leak into the car.

In one group of over 1,000 cars a few years ago the plywood side linings had to be replaced because of such nail holes. Additional back up strips with "Nail Here" signs in front of the strips were not enough to keep people from driving nails where there was nothing behind the plywood. After a few trips in which nails were used to secure lading enough holes remained to render the cars unsuitable for bulk lading and to require replacement of the lining.

Another weakness of plywood is that the sheets tend to buckle, apparently from dampness. Partially this occurs because the sheets are thinner than standard T-G lumber. Remedying the situation by using thicker sheets is expensive. So too is the use of additional supports to control the buckling.

Plywood has less resistance to damage from lift trucks than regular lumber. Where ordinary wood will often stand a blow without serious damage, plywood chips off a layer at a time.

Some of the disadvantages of Plywood are relatively easy to overcome —but at a cost. An order of cars delivered to the Southern a year ago, with ¾-in. plywood side and end linings is protected against nail holes by lading strap anchors and slots which reduce and perhaps even eliminate the need for nailing. Protection against bumping by lift trucks is attained by a steel plate 4 ft high all around the car. The plate in turn is coated with .015 in. of Neoprene to protect against rust and corrosion and to add some resiliency. The upper portion of the lining is attached by 2-in. screws to three horizontal furring strips to eliminate the possibility of nailing damage and to simplify renewal of any sections that may become damaged in service.

On the plus side, plywood makes as smooth highly desirable interior surface. Fewer joints are required and the danger of infestation is reduced.

For outside sheathing, plywood is considered more durable than conventional T-G lumber and retains an acceptable appearance longer.

Installation Costs Are Less

A further advantage of plywood is that labor savings can be appreciable. One eastern line found that five cars can be re-lined with plywood in the same time two can be re-lined with T-G. Average actual reduction per car was 5½ man-hours. This shop applied the plywood right over the worn-out T-G lining.

In addition to these general advantages, plywood also offers specific advantages for individual uses. In applying ¾-in. exterior grade plywood to interiors of remodeled cabooses, the B&O felt that the improvement in neatness and appeal alone justified the additional cost of plywood due to the effect on morale. The plywood interiors also keep the caboose warmer by reducing heat loss; they are easy to paint; have not been found to warp and are less subject to cracks, splintering and chipping.

Individual roads report additional factors involved in deciding whether to use plywood. One line reported theft as quite a problem—cars would be stripped bare of the lining.

Several lines that use the better grades of plywood (like marine grade) attribute failures on other roads at least partially to the use of cheaper grades. Failures are also attributed, in some instances, to not

using heavy enough sheets at critical locations. To avoid this, one line that uses 7/16-in. plywood for reefer side lining applies 7/8-in. plywood end lining to stand switching shocks better. Another road installs 3/4-in. side lining and 1-in. end lining in box cars. Others find, however, that sheets as light as 3/8 in. are satisfactory for side lining where the service will not be severe (food cars, as an example).

Application also affects the life of plywood. One line that uses plywood extensively for reefers experienced trouble with buckling. This was eliminated by leaving 1/16-in. clearance between the edges of the sheets. However, this procedure may not be the complete answer for box cars to be used for bulk loading, where the buckling force is far greater. An additional factor thought to help prevent buckling is the nailing practice—nails are applied and driven consecutively from one side to the other.

How Repair Problems Compare

It may seem at first that one of plywood's advantages may be greater ease of repairing damaged sections due to the absence of the interlocking tongue and groove. Lack of support along the joint of the renewed portion is generally considered to make it impractical to replace small damaged sections. This may be a major reason why a number of lines like plywood for refrigerator cars (where physical damage is small) but not for cars subject to damage from lift trucks, nailing or heavy bulk loads. This is also the reason several lines want metal protection plates around all wooden linings, plywood or not.

The new plastic upgrading materials may help plywood's future by reducing the repair problem in one of two ways. One way is by making it easier to repair small damaged sections. This would remove one of plywood's relative disadvantages.

The second way that plastic upgraders can help plywood is as an initial application to new linings. In other words, use the plastic coating to *prevent damage* from occuring rather than to *repair damage* that has occurred. (The coating would of course offer the same advantage for standard lining—thus it is a question which receives the greater relative benefit). This is being done on truck trailers where, for $100 worth of material and 12 man-hours of labor, the floor, sides, ends and ceiling are covered. The procedure is expected to increase the life of the plywood two to four times.

So far as is known, this practice is not being followed in freight cars with plywood lining. However, the Union Pacific has done something similar on conventially lined box cars. Instead of using upgrader materials to patch up damage, the UP applies the coating to cars with fair to good lining to increase its life. The cost to cover the complete car interior (floor, sides and ends) runs around $200 for material and $100 for labor.

The Great Northern is one of the more extensive users of plywood—both to the inside and outside of cars in repair programs. The GN has also used plywood in new car construction, (2,000 cars between 1944 and 1947). However, once steel became readily obtainable, the use of plywood externally was discontinued in favor of steel.

But the question remained as to what to do to repair some 8,000 existing 50-ton cars with 25/32-in. tongue-and-groove sheathing bought from various builders between 1937 and 1942. To compare plywood with standard T-G exterior siding, field examinations were made of the condition of the road's 1944 plywood cars and of the condition of conventional-siding cars of the same age.

From these surveys, GN officers considered that the plywood cars seemed more durable and kept their good appearance longer. Hence, the

Some roads have used jigs to mark the spots in plywood panels where nails will be driven. This procedure insures even nailing during panel application.

Side lining of the MP general service box car is applied with panels horizontal and 2-in. space above the floor.

Plywood was used for the ceiling, lining, and sub-floor of twenty Texas & Pacific insulated Evans DF box cars.

company initiated a general repair program on 500 cars using 5/8-in. vertical plywood as outside sheathing. Later, a second program was undertaken with the plywood sheets being applied horizontally for comparison. The horizontal application was considered better for this job because (1) eight over-sized panels substituted for 16 vertical sheets; (2) less re-framing was needed; (3) the finished car looked better; (4) the car was strengthened longitudinally.

The Frisco last year upgraded 235 wooden box cars by applying steel sides and 3/8-in. exterior grade plywood side lining. The 40-ft cars after rehabilitation will handle only edible foodstuffs like sacks of flour, powdered milk, rice and beans.

Handling food is the duty of another group of plywood-lined cars—those on the D&RGW which has 35 "cookie box" cars for transporting bakery goods. These are 40-ft cars with 3/4-in. insulation in the side walls, ends, ceiling and doors.

The sides and ceilings are 1/4-in. plywood, the door lining 1/2-in. plywood. Ends are conventional T-G.

Installation time for the application of the plywood lining is eight man-hours, including painting time for two coats of clear sealer on the interior. Cost of the plywood is about $122.00 per unit.

In rebuilding the interiors of cabooses, eight sheets of plywood 4-ft by 8-ft substituted for 100 pieces of T-G in lining the sides—half in 24-ft lengths and half in 8-ft lengths.

Plywood subfloor and side wall lining is an accepted part of modern passenger car construction. Above is Burlington Zephyr car which is being completed at the Budd plant.

Insulated Food Cars

Another type car in which plywood has been used recently is the insulated box car. The T & P built 20 such cars last year to prevent "sweating" when the temperature warms up a cold shipment and to prevent freezing of the lading when it turns cold. These cars have plywood ceiling and lining, and a 3/4-in. sub-floor of plywood.

These cars are insulated like refrigerator cars and equipped with Evans DF lading-protection equipment like box cars. The DF equipment includes steel belt rails to anchor the bulkhead cross members and wood rub rails approximately flush with the edges of the steel rails to protect the merchandise from the otherwise protruding belt rails. The cars have special air-tight refrigerator-type doors with 3-in. insulation which slide and clamp tight.

Aluminum paint is used throughout on the interiors of the cars for good light reflection. The exterior is coated with yellow paint, sprayed hot to dry rapidly so that the car is ready for the second coat by the time the first coat is completed.

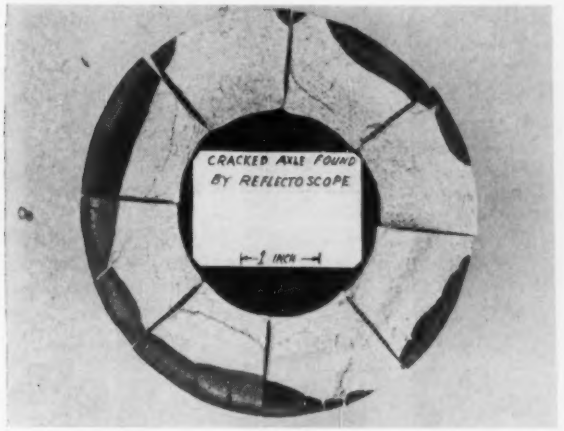
The Missouri Pacific uses heavy plywood to line new box cars, presumably because they are used in general service and therefore subject to more abuse than some of the special service cars referred to previously.

The MoPac uses 3/4-in. plywood for side lining and 1-in. for end lining. Both have an 11/16-in. groove into which is inserted a metal spline. Used in between each plywood sheet, this spline affords a strong and attractive plywood wall siding.

The bottom row of side lining consists of fir plywood sheets 26-in. high which are nailed to provide a 2-in. space above the floor decking. End linings are secured with no open space. All panels are applied horizontally.

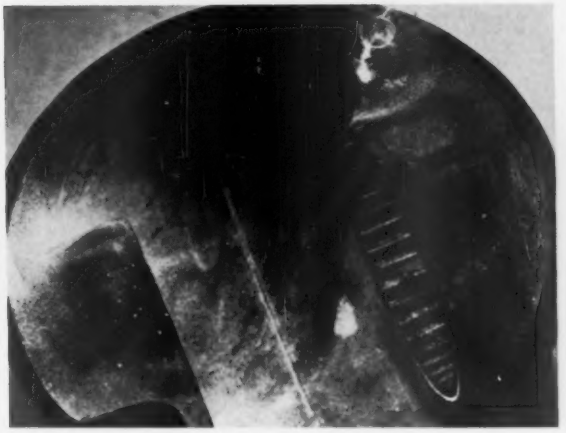
The MoPac estimates that the plywood cost for both the side and end lining in a 40 1/2-ft car is approximately $204. Labor costs for the same car will amount to approximately $13.

FREIGHT CAR AXLE . . .



Reflectoscope indicated freight car axle flaw, and depth is indicated here.

DIESEL PISTON CARRIER . . .



Magnaglo inspection was able to detect this flaw in GM diesel piston carrier.

SP Gets To the Heart of Things . . .

Using Non-Destructive Testing

As the use of diesel locomotives increased, there has been need for special kinds of inspection. Diesel valves will not take a satisfactory magnetic test due to high percentage of chromium and nickel. Other methods such as the Zyglo fluorescent penetrant type of non-destructive test have been applied to this problem. Zyglo "Pentrex" fluorescent penetrant inspection is set up for inspection of valves at all major points on the SP where diesel maintenance is performed. The primary concern is checking the used valves at time of engine overhaul to be sure that these important parts are free from heat checks or any defects which would impair the normal service life. Representative new valves are also tested and this practice may be extended to 100 per cent inspection of valves if found necessary. All defect indications in head portion of valves are cause for rejection with exception of the circular mark which appears near the center of head on some valves and is caused by the forging hammer operation. Stellite-faced valves must be carefully inspected to see that there is a good bond and no porosity where the two metals are joined. The lower end of the valve stem is also checked closely and no valves which show defect indications, either longitudinal or transverse, below ½ in. from the upper keeper groove are used. Longitudinal seams up to one inch in length and located more than ½ in. above the upper keeper groove are not considered injurious to service life of the valve. During April, 1956, 723 used valves were inspected at Sacramento shops and 336 or 46.5 per cent rejected.

Diesel Engine Valves Inspected and Found Defective:

	Number inspected	*Number scrapped*
EMD 1500 hp. freight diesels	287	176
ALCO 1000 hp. switchers	90	18
ALCO 2000 hp. passenger diesels	323	133
Baldwin	23	9

Diesel engine parts, made of ferrous materials, can be tested to best advantage with the Magnaglo type of magnetic particle inspection. The connecting rods, fork rod baskets, drawbar pins and similar parts require a longitudinal magnetic field applied continuously with strength about 2000 to 2400 amp. turns. Piston carriers, wrist pins and bearing rollers require a circular field as produced by passing current through the part, or through a hole or opening in the part. Diesel pistons are subject to fatigue flaws at several locations and directions so that both a longitudinal and circular magnetic field must be used to assure complete inspection for all defects.

The tests mentioned thus far are essentially for surface crack detection and examination. For detection of internal flaws, the SP uses radiography with X-rays and with gamma-rays, sonic methods and ultrasonic methods as well as electrical and magnetic field tests which have been applied to rails.

A Sperry Model SR05 ultrasonic reflectoscope, purchased by the SP in 1949, was one of the first used on the Pacific Coast. It has served well for test of driving axles on steam locomotives and to a more limited extent to crankpins. Now a later model equipment suitable for immersion type testing and a tank are being installed in the laboratory at Sacramento for this purpose.

In order to evaluate the ultrasonic inspection of freight car axles, axles

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Reported by A. S. Pedrick, asst. eng. of research and mech. stds. at ASTM meeting, Los Angeles.

Radiographic inspection requires special facilities for storage and handling of the radio-active isotope. SP has this installation.

Zyglo inspection revealed these cracks in diesel engine valves.

were tested on all cars as they arrived at Sacramento shops. In 1,000 cars given this test, four cracked axles detected. These axles were checked by magnetic particle inspection to verify the flaws and then cut in segments and broken open to disclose the depth of fracture, as illustrated.

None of the cracked axles gave any surface evidence of overheating and had apparently been functioning in a satisfactory manner up to the time the cracks were discovered by ultrasonic inspection and the axles were then removed from service. The flaws varied in depth from ¼ to ¾ in. and the local high-stress condition set up would eventually cause failure and possible derailment of equipment if continued in service.

A diesel locomotive driving axle was sectioned through locations where several flaws were indicated by the reflectoscope in order that ultrasonic indications could be correlated with actual physical findings. Ultrasonic inspection has been under study by the steel wheel manufacturers as means of preventing shattered rims which sometimes occur in diesel locomotive wheels. This condition is usually caused by laminations or inclusions during the manufacturing process.

The conclusions reached in this study are that the reflectoscope provides an excellent tool for quality control in the production of wrought steel wheels. However, numerous variables are involved—difficulty in estimated size of the discontinuity; effect of orientation of defect; effect of surface finish; blind spots at locations close to the searching crystal; and variations between different instruments.

Thus it is seen that there are some problems to be worked out in applying this inspection to new wheels at manufacturer's plants. Test of used wheels would be much easier since the progressive fatigue fractures looked for in maintenance inspection are relatively large and are visible at the surface, so the maintenance inspection may be performed more effectively by other methods.

X-Ray Inspection Helpful

X-ray type inspection has a definite usefulness on the railroads. Tests similar to this are being performed at the Sacramento laboratory, using gamma rays from radium or from radio-active Cobalt-60. A 5-curie source of Cobalt-60 is available for radiographic inspection purposes, and also a smaller source which at time of purchase in July 1950 had a strength of 620 millicuries.

The 5-curie source must be handled with a good deal of caution. When not in use, it is stored in a pit lined with six inches of concrete and eight inches of lead, and is sealed by a lead plug. A spherical lead container with a six-step conical door provides a beam of radiation in limited area when the capsule is in the container and no exposure to the operator if he remains to the rear of the container. The usual procedure for radiographic test of couplers and yokes is to arrange these parts in a circle with the capsule in the center. X-ray films in cassette envelopes are taped to the back of the parts under test. Lead foil on both sides of film in cassette reduces the amount of exposure required, due to effect of secondary electrons produced in the lead screens by the incident gamma rays.

The exposure required varies according to the distance from the capsule and thickness and character of the metal. A greater distance gives sharper outline of blowholes, cavities, etc., but increases exposure time. A section of steel, 1-in. thick, at a distance of 6 ft requires about 2.5 hrs exposure using a gamma ray source of 6000 milliroentgens. Sometimes two exposures are made at different angles through the part in order to give a better indication

of shape and character of inclusions of foreign material, porosity, blowholes or shrinkage cavities in steel castings.

Black Light Shows Fuel Leaks

A new test which has proved helpful to the railroads is the application of high intensity black light to the problem of finding fuel leaks in diesel engines. Most of the railroad diesel engines have a crankcase capacity of approximately 200 gal. of lubricating oil. Fuel oil leakage into the lubricating oil is one of the most common causes for crankcase oil changes. Fuel oil dilution of 5 per cent is allowed depending on the equipment and type of service. The amount of dilution is indicated by viscosity tests and flash point at control laboratories, but the finding of small leaks or mere seepage of fuel from joints and pipe connections in the engine becomes a difficult problem.

This form of non-destructive test takes advantage of the fluorescent characteristics of fuel oils and lubricating oils. When exposed to black light, lubricating oil appears as an opaque "milky-purple" color. Fuel leaks can then be located by shining high intensity black light on the fuel injectors and fuel oil lines, at the same time having fuel pump in operation so that normal pressure will be present and looking for areas showing purple color. Black light is also helpful in observing the spray pattern of diesel fuel when testing fuel injectors.

A useful non-destructive test will provide reliable measurements or indications that can be correlated with properties of materials or discontinuities which would affect the serviceability of materials, parts, structures or assemblies. Assuming the most effective form of test has been selected for requirements at hand, there is still a problem of training operators so that best results will be obtained with these special tests. The operators must have sufficient understanding of the principles underlying the method used and for proper application of the equipment to make the test most effective. Any testing device or procedure is only as good as the understanding of the people who use it.

An electron microscope is used at the Sacramento laboratory in checking stability characteristics of diesel fuel oil and effectiveness of additives in fuel oil and in lubricating oil. Spectrographs and quantometers have also become quite common in railroad laboratories. The SP has two Applied Research Laboratory spectographs. One is in general use at the Sacramento laboratory for foundry controls and miscellaneous testing on unknowns. The other instrument is at the Los Angeles shop laboratory and is used for checking trace elements in diesel crankcase oil.

Oil and Water Testing

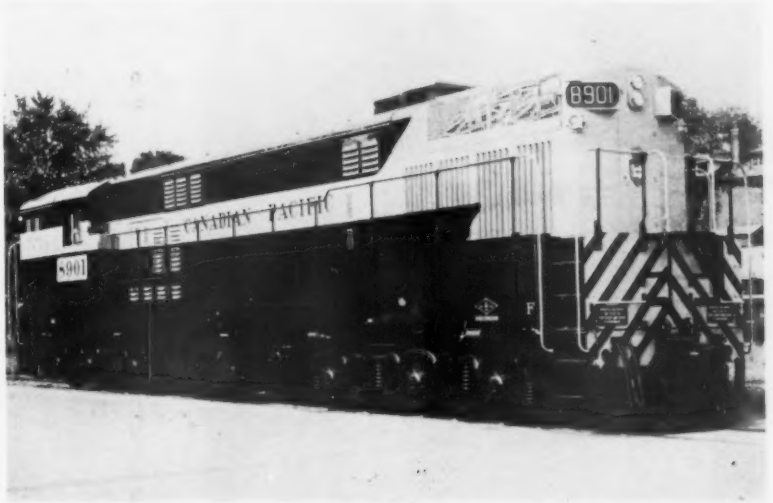
The test of crankcase oil and cooling water from the diesel engines is one of the major activities at the SP laboratories. They have a total of four branch laboratories and a staff of 16 chemists performing this work. This is in addition to a staff of 23 at the Sacramento general laboratory. Oil is drained only when the specified condemning limits have been reached or on judgment of the supervisor in charge in connection with mechanical work on the engines.

Use of the spectrograph has been highly publicized as an oil control and for indication of excessive wear in diesel engines. SP experience with this equipment over a period of several years has not confirmed these advantages. The indications of trace metals are not always representative of engine wear due to sampling errors and other variables, so the results are often misleading. Routine use of the spectrograph on oil samples has been discontinued but this instrument is applied to analyses of engine deposits and other special problems when the need arises.

With further reference to applying non-destructive tests to railroad maintenance, it should be realized that each type of test will reveal only the specific kinds of defects or discontinuities for which it is designed or best adapted. It will not be a cure-all to overcome lack of knowledge as to reason for service failures and specific nature of materials or prevent early fatigue on account of poor design or improper manufacturing practice.

The proper use of non-destructive tests can, however, give additional factual data which is helpful from the standpoint of engineering and design.

CPR "Train Master" Has Wide Hood



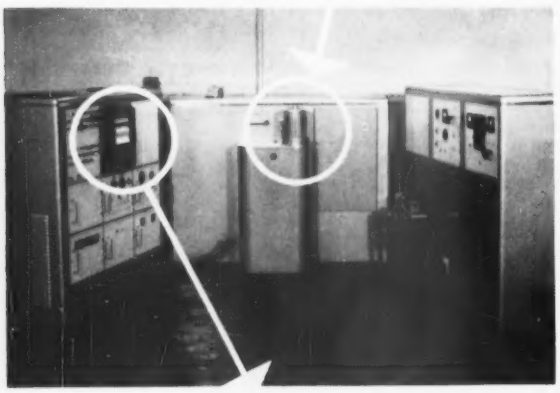
Canadian Pacific got the first production run of twenty Canadian-built "Train Masters". Previously the Canadian Locomotive Company has relied on Fairbanks Morse for most of the components; for these units F-M supplied only engine parts such as crankshafts. Locomotives have General Electric transmission equipment. To make it possible to install two Vapor 4625 steam generators, the hood back of the cab was made full locomotive width on four of these units intended for passenger service. Special fuel tanks have capacity of 1,650 imp. gal.

Quantometer Speeds Evaluation of Locomotive Lubricating Oils

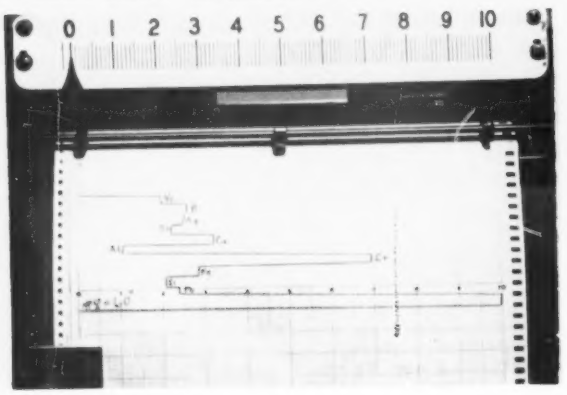
By V. C. BARTH,
Assistant Engineer of Tests
Chicago & North Western

Oil Sample Is "Burned" . . .

And Measured in Quantometer . . .



Results Show Elements . . .



Recorder produces graphic record of concentrations.

To appreciate advantages of the direct-reading spectrographic analysis of used railroad oils, fuller understanding of the two types of spectrochemical analysis is of value. In the photographic emulsion method, light from the ignited oil sample is diffracted by a concave grating and the different wave lengths of light representing the various elements are directed to a photographic plate where exposure occurs. The photographic plate is subsequently developed and the intensity of the exposures, evaluated in terms of density, is related to the concentrations of the various elements.

By the multiplier phototube method, light from the grating is picked up by phototubes which change the light into current and amplify it up to a million times. This means that measurement of extremely small concentrations of an element is possible in a given lube oil sample. In the production control quantometer (Applied Research Laboratories, Glendale, Cal.) the current from the multiplier phototubes is fed to respective condensers. The charge is further amplified and is then fed to an L&N recorder where the apparent concentrations of different elements in the sample are consecutively recorded in sequence. The apparent values on the recording chart must then be corrected to actual concentrations by means of a calculated chart.

Analysis of a given sample can be completed in a fraction of time—about 2 min—using the direct-reader

Abstract of paper presented at ASTM meeting, September 17, 1956, at Los Angeles, Cal. The author is now chief metallurgist and engineer of tests of the C&NW.

Recorded Continuously . . .

EMD E-7 — SPECTROGRAPHIC ANALYSIS (PPM) — 12

DATE AND POINT SAMPLED	Pb	Si	Fe	Cr	Al	Cu	Sn	Ag	Remarks
3-19-55	9	2	70	46	21	22	5	1.4	
3-26	16	6	94	(104)	28	27	4	1.3	$\surd H_2O$
4-4	23	2	95	(95)	20	18	2	0.6	$\surd H_2O$
4-10	30	9	70	(122)	27	22	7	1.2	$\surd H_2O$
4-19	(88)	8	80	(544)	24	(44)	3	0.8	$\surd H_2O$ INSPECT BRGS. SHOP
4-23	(144)	(23)	114	(550)	34	(68)	2	1.6	
4-27	(160)	(55)	116	(600)	36	(75)	2	2.6	

CRANKSHAFT SAVED
ALL MAINS WIPED
6" CRACK, #3 TOP DECK

Weekly samples are tested and recorded to produce history.

metnod as contrasted to the photographic method. In fact, only two steps are required with the direct reader as compared to five steps with the photographic method.

Another labor and time-saving device is the Rotrode method of exciting the oil directly. This method may also lend itself to adoption with the photographic emulsion method although our experience is limited in this respect. A small sample (about 2 to 3 ml.) of oil is placed in an aluminum boat which is then positioned in the excitation stand. A rotating high purity carbon electrode disc 0.20-in. thick and 0.50-in. dia, which turns to pick up the oil at a rotation rate of 5 rpm, is partly submerged in the oil. This carries the oil into the arcing zone where a counter electrode is gapped at 3 mm. The method totally eliminates the time-consuming pre-ashing technique and yet gives excellent sensitivity.

It is almost a universal practice to employ an internal standard for spectrochemical analysis. A technique has now been developed with the direct-reading method of eliminating the time-consuming operation of adding an internal standard into each sample of lube oil. With the production control quantometer the reflected beam can be employed as an internal standard. Instead of putting a given amount of an internal standard such as cadmium or lithium into the sample, a portion of the light from the arc reflected by the grating can be viewed by a phototube that charges a condenser to a preset value. When this condenser reaches that value, the arcing is terminated and the charge on each of the condensers produced by the various elements, is measured by the L&N recorder. All elements are recorded in relation to the reflected beam rather than to any added internal standard.

This technique is generally unique in that apparently no one else is employing the above two steps in combination for the evaluation of used engine oil. At the start our aim was to develop a quick, simple, reliable and economical method of analysis. This objective has been achieved with gratifying results. Check runs comparing this technique with that of about 12 other railroad and industrial laboratories employing both photographic and phototube spectrochemical methods, has proved accuracy equal or superior to the other more involved standard methods. Further, two men can analyze, correct, record and report a minimum of 124 runs per 8-hr day, including necessary profiling, calibration and standardization.

The actual evaluation of results from an engine is of paramount importance and is quite involved. Reliable decisions require evaluations and study of (*1*) normal engine wear trend, (*2*) engine history, (*3*) correlations of metals and contaminants, and (*4*) follow-up lube oil samples. Engines of different manufacturers give characteristic reactions when trouble develops. However, individual engines of the same make can react differently when having the same defect.

It cannot be emphasized too strongly that engine history is essential to properly diagnose any engine distress. By engine history is meant mechanical work performed, engine age, past physical and spectrochemical results, and defects formerly experienced. With respect to setting allowable limits for wear metals or contaminants, we are of the opinion that this is not practical. However, limits have been set on the values to serve only as an aid to any diagnosis.

For instance, if chromium from the cooling water treatment should build up to 60 ppm (parts per million) or more, engine attention is required to find and correct the source of a water leak. If a subsequent lead and copper reaction follows, bearing distress may exist and at least a spot bearing inspection is advised. Should no bearing reaction be in evidence, only the water leak need be repaired.

On the other hand, high lead and copper is usually a normal occurrence on new or overhauled engines during break-in period. In this event, bearing inspection would be useless or damaging and could even lead to failure. It must also be realized that much lead and copper is found throughout certain engine assemblies, all of which may simultaneously contribute to high readings. Generally, however, after an engine is fully broken in, a definite level or trend is established from which any deviations can be a justified cause of concern.

In the first example involving a water leak, note the chromium increasing and after about 15 days of operation the lead and copper values increase indicating a bearing reaction. The engine was inspected three

(*Continued on page 62*)

And Interpreted This Way . . .

When LIMITS AS FOLLOWS ARE EXCEEDED, reliable decision requires evaluations and studies as follows: (1) engine trend, (2) engine history, (3) correlations of metals and contaminants, and (4) follow-up lube oil resamples.

a)

	Parts Per Million				
		ALCO			
	EMD	112	XK	BLW	FM
Lead	40	20	5	10	15
Silicon	10	10	10	10	10
Iron	200	40	40	40	70
Chromium (water)	60	60	60	60	60
Chromium (wear)	30	30	30	30	30
Aluminum	40*	15*	15*	15*	15*
Copper	40	10	5	10	15
Tin	15	10	5	5	5
Silver	5**	-	-	-	-

(*With no excess silicon - air-born-dirt).
(**Maximum of 10 may be allowed with WR-1717 and Gascon 0-HD Oils).

FOLLOW-UP LUBE OIL SAMPLES ARE REQUIRED WITHIN SEVEN DAYS to confirm corrective action in 2 and 3, and to substantiate developing trends in 4.

C&NW has established concentrations which are considered dangerous.

To Anticipate Failures.

Bearing was wiped before being located.

Low-cost baggage cars will permit the Rock Island to write them off rapidly and be prepared to purchase new equipment or rebuild these cars as passenger situation changes. Over pulling faces the cars are 70-ft ½-in., over strikers 67-ft 6-in.

Rock Island Seeks Passenger Service Solutions and ACF Supplies . . .

New Approach to "Head End" Problem

The June meeting of the AAR Mechanical Division heard a statement by a Rock Island representative reporting that the line was getting some head-end equipment costing less than comparable conventional cars previously purchased by the CRI&P. In August and September the latest models of these cars were delivered by the Berwick, Pa., plant of American Car & Foundry. What the Rock Island has received are two types of 70-ft baggage express cars with freight-car contour roofs. From the rail up they are designed for high-speed, long-distance operation.

On the rail are a pair of General Steel's four-wheel BX type trucks. These trucks have 5-1/2 x 10-in. Timken roller bearings, Stucki side bearings, Creco brake beams, and Westinghouse Cobra brake shoes. Wheel base of these trucks is 5-ft 10-in., and they have 33-in. multi-wear rolled steel wheels.

Structurally these cars are of the welded girder type conforming to the strength requirements of both the AAR and RPO specifications. The welded underframe assembly is built up around two continuously-welded, 36.2-lb Z sections of low-alloy, high-tensile steel. These AAR sections give a total center sill area of 21.3 sq in., and extend the full length of the car. The box type body bolsters are built up of 5/16-in. webs, and 7/16-in. cover plates. Built-up welded bolster center fillers and rear lugs are used.

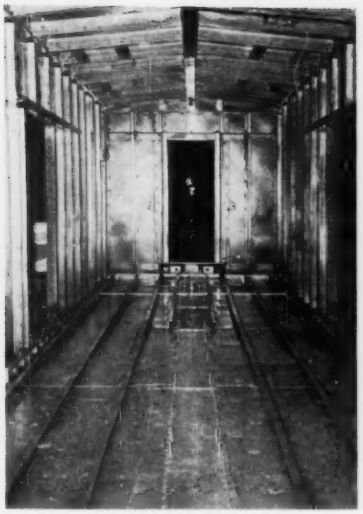
National Malleable multi-pad, rubber-cushioned draft gears are used with Type F couplers. Each end of the underframe is fitted with a cast steel combined striker casting and coupler carrier including carrier springs and retainer plates. Mounted on this underframe are two 7 x 6-in. brake cylinders—one for each truck. The cars utilize Westinghouse 26 brake equipment—the same air brake equipment previously used on the Talgo-type "Jet Rocket." Brake equipment includes two Westinghouse A-16-D slack adjusters, one emergency brake valve, and one signal valve. The Peacock handbrake can be operated from the interior and exterior of the car, and acts on one truck.

Through the length of the underframe are 13 Z-section crossties running across the car. There are six built-up crossbearers between the two body bolsters. End sills are 3/16-in., pressed U sections welded to the center sill and riveted to the side sills.

These side sills are 6 x 6 x 5/16-in. angles extending the full length of the car. They are reinforced through the center with 6-in. 12-lb channels extending past the outer edges of the side doorways. The twenty side posts on each side of the car are the same 3-in., 5.1-lb Z sections used for crossties. Door posts are 4 x 3 x 1/4-in. steel angles reinforced at the side sills with 5/16-in. gussets. Door headers are this same angle, and above them are cripple posts of the same Z section used for the side posts. All these posts are welded at the top to continuous lengths of Standard Railway Equipment's ZU side plate.

Welded to the all-welded side frames are 0.105-in. low alloy, high-tensile steel side sheets. End sheets and roof sheets of the car are of copper bearing steel. On each side of the end door opening are 8-in., 28-lb CB beams extending from the end sill to the end carline. At each end, running between the two 1/4-in. W-section corner posts, and between the two side plates, is a 10-in., 20-lb channel which is welded to the intermediate framing, and serves as an anti-telescoping protection.

The end sheathing of the car is in three pieces. Each of the two side sheets is 0.120-in. thick, and the portion over the doorway is 0.180-in. The 24 carlines are shaped to the contour of the standard AAR freight car roof, and are made of 5 x 3-1/2



Interiors of cars are finished with plywood panels applied to steel framing.

The interior length is 65-ft 7½-in. and interior width, 9-ft 2⅝-in. Fifteen of the cars have the messenger facilities.

x 5/16-in. carbon steel angles. Roof sheets are 0.075-in. copper bearing steel welded to carlines and side plates. Passenger car ventilators are used in this roof.

The false floor is 0.060-in. galvannealed steel sheets riveted to the crossties and floor stringers, and welded at the edges to the center sill, side sills, and crossbearers. The longitudinal floor stringers are 3-in. Z-sections and there are six of them across the width of the car. Yellow pine furring strips attached to the stringers support the 1-3/4 x 5/16-in tongue-and-groove flooring. This flooring is applied transverse of the car and secured to framing with watertight bolts and speed nuts.

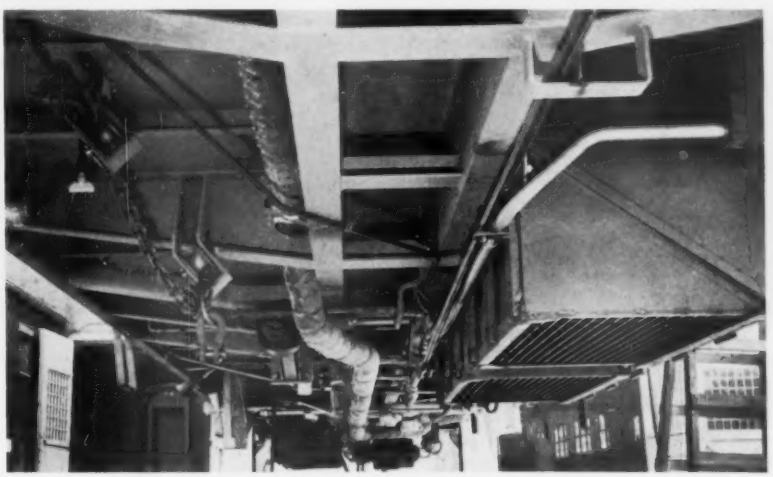
Fifteen of the twenty-five cars in this order have messenger facilities. These messenger cars are also equipped with fish racks. This meant a variation in the floor construction to hold the galvanized drip pans and drains under these racks. All of the cars have a 6-ft, single door opening, and an 8-ft, double door opening on each side. All side doors are sliding, 1-1/4-in. Plymetal type. All side doors in the messenger cars, and the 6-ft doors in the other cars are glazed with 1/4-in. Duolite safety glass. End doors are built-up steel construction.

Car ends are fitted with Morton single-fold diaphragms. The 0.180-in. pressed diaphragm face plates are supported by rods in rubber mountings, and are positioned with ACF lower buffer mechanisms and Standard Railway Equipment's upper buffer springs.

The car sides, ends, roof and floor are insulated with 1-in. thicknesses of Jhons-Manville stone felt. The side and end linings are 1/2-in. exterior-grade, Douglas fir plywood secured to framing with self-tapping screws. The headlining is 3/16-in. preswood secured to furring with Screwtite nails. The electric locker, clothes locker and toilet enclosures on the messenger cars are steel sheets.

Heating on all the cars is with Vapor manually controlled aluminum-finned copper tubing. This tubing is protected in expanded metal enclo-

Welded underframe is built with a truck center distance of 52-ft.



There are individual, body-mounted brake cylinders for each truck, and they are actuated by Westinghouse 26 equipment. Only messenger cars have the battery boxes.

sures. Lower side door tracks have steam lines under them to prevent freezing. The steam train line is 2-7/8-in. OD steel tubing with Barco 2-1/2-in. metallic connectors at each end. The messenger cars have a gravity type water system fed from an insulated 40-gal. overhead tank. Water is piped to an Ajax Consolidated water cooler, and to the toilet facilities. Hot water is supplied through a Vapor heater and mixing valve. In the toilet are a Mink stainless washstand, and Duner hopper.

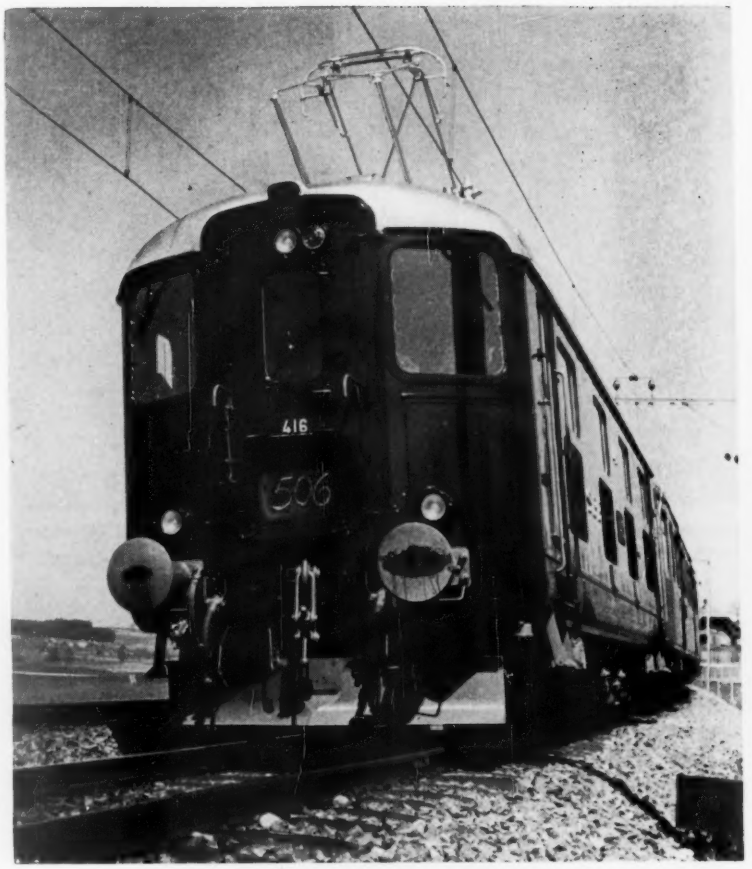
Electrical Equipment

The messenger cars have a desk and a 60-hole letter case. These cars also have axle generating equipment. This 64-volt dc system includes a Safety 4-kw body-hung axle generator driven through a Dayton double V-belt drive, Safety generator regulator and reverse current relay, Safety switchboard, and two 5-tray A-8 HW Edison batteries. Lighting is provided with seven Safety ceiling fixtures and four side-door lights. Both messenger and non-messenger cars have 1/0 trainlines with Pyle National two-wire trainline receptacles and P-N two-wire trainline connectors.

The non-messenger cars have four ceiling lights equipped for 32-volt operation, and a permanent 30-ft extension cord. The DPDT lighting switch has both 32 and 64-volt positions, and 110-volt standby power can be utilized through a General Electric dry-type auto-transformer which drops the voltage to 60 volts.

Underframe and interiors of sides, ends and roof are painted with standard freight car primer. In addition the underframe is painted with freight car black paint. The lower part of the side and end structure and sheathing, and the sub-floor assembly are painted with Rustoleum. The exteriors of the sides, ends, doors and roof receive one coat of red oxide primer and two coats of Dulux aluminum gray paint. The plywood lining is painted with one coat of primer and sealer followed by two coats of RPO green enamel. The ceiling is finished in high glass white enamel. The black external stencilling is sprayed.

The messenger cars have a capacity of 25 tons and a cubic capacity of 4,975 su ft. They weigh 90,000 lb. The other cars have a cubic capacity of 5,287 cu ft, a load limit of 35 tons, and weigh 78,500 lb.



Electric Locomotive of Swiss Federal Railways

Wheel Slip Can Be Controlled Without Sand

When a pair of driving wheels slip on one of the recently equipped Swiss Federal Railways locomotives, the operator pushes a button which initiates a light application of straight air brakes on all drivers. Release of the button causes an almost instantaneous release of the brakes. Such brake applications are of very short duration. The time is long enough to bring the slipping wheels down to locomotive speed without causing appreciable braking of the locomotive. With brakes having 2.75 in. brake piston travel, the time required for an application is .32 sec, and for release it is .4 sec. When the piston travel is 5.5 in., the application time is .8 sec and the release time .65 sec.

Brake control of wheel slip also serves to keep wheel treads in a condition which is not conducive to slip. Brake control of wheel slip was first tried in 1951 on the Swiss railways. At present, 80 locomotives are so equipped, special attention having been given to new electric and diesel-electric locomotives put in service since 1953.

The same equipment has been ordered for 280 existing locomotives and will soon be delivered. Subsequently, about 60 per cent of all electric motive power for main line service will be equipped. Locomotives in yard service are equipped with only one sand pipe for each direction of locomotive movement. All the other sand pipes are removed

No difficulty has been encountered in using the brake on locomotives and railcars operated in multiple unit. Twelve type 1-D-1 locomotives operated in multiple unit were first to be so equipped and the use of the device on electric multiple-unit equipment operated in suburban service has just been started.

The wheel slip indication device used is based on the difference of current values in the traction motors on a locomotive or car. This difference is measured with an ammeter having a special dial which is placed on each engineman's desk.

To check the effectiveness of the device, sandboxes were sealed on several locomotives. In addition, the sand valves on 26 locomotives were locked. It was found in this manner that the anti-slip device is even more effective than sanding. It is the intention of management to build a series of new electric locomotives without any type of sanding device.

The device known as the anti-slip brake, was designed by S. A. Brown, Boveri & Cie, Baden, Switzerland, and was developed and simplified by the Ateliers des Charmilles, S. A., Geneva, Switzerland.

The Anti-Slip Brake—How It Works

The brake control valve shown in the diagram is made of phosphated cast iron. Moving parts are made of oxidized aluminum alloy. The valves and valve guides are brass and the springs stainless steel. The chambers are separated by flat membranes made of soft synthetic rubber. Operation of the engineman's pushbutton applies 24, 36, or 72 volts to the electro-pneumatic valve depending upon the voltage of the locomotive auxiliary power.

Applying the Brake

When the brake is not in operation, air from the main tank through *lead 1* keeps pressure in *chamber 2*. *Valve 3* is kept open by the pressure of *spring 4* until air from *chamber 2*, passing through *valve 3* builds up enough on *membrane 7* to close *valve 3*. By adjusting the tension of *spring 4*, the pressure in *chamber 6* can be varied from 1.1 to 7 lb per sq in.

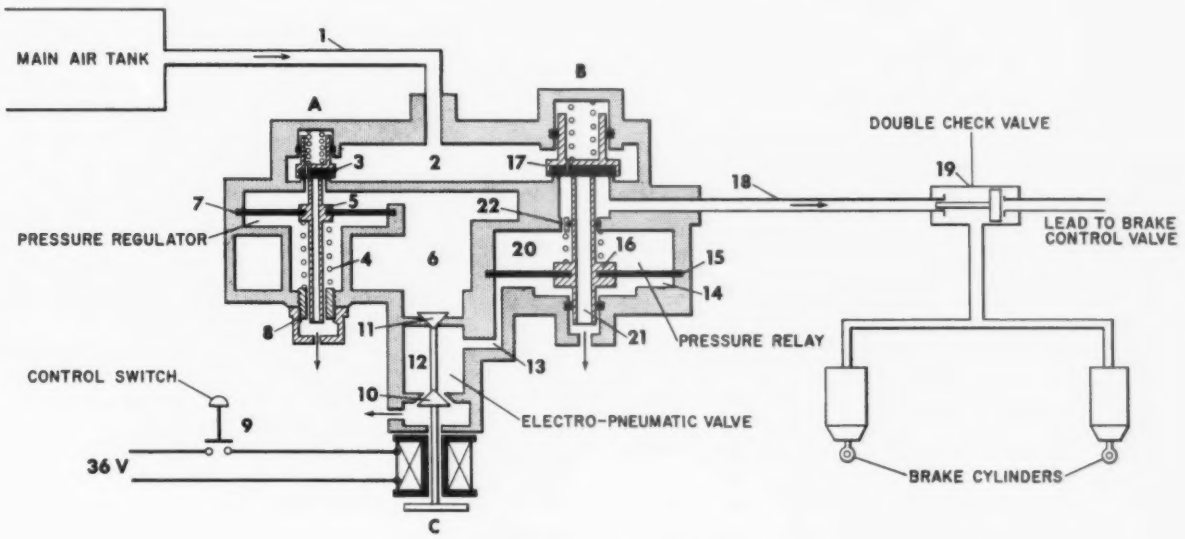
When the electro-pneumatic valve is energized by the engineman, the *outlet valve 10* is closed and the *intake valve 11* is opened. Air then enters *chamber 12* and passes through *lead 13* to *chamber 14*. This applies pressure to the lower face of *diaphragm 15*. This raises *assembly 16*, opens *valve 17* and shuts off the *outlet lead 21*. Air from the main air tank pressure in *chamber 2* then enters *chamber 20* and flows through *lead 18* and through the double check *valve 19* into the brake cylinders.

When the pressure in the brake cylinders has equalized with the pressure in *chambers 6* and *14*, namely 1.1 to 7 lb per sq in., the *assembly 16* moves down and closes *valve 17*, shutting off the passage between *chambers 2* and *20*.

Releasing the Brake

The moment the pushbutton is released, *intake valve 11* closes and *outlet valve 10* opens. This allows air to escape from *chambers 12* and *14*. Pressure in *chamber 20* then causes the *assembly 16* to move down, uncovering *lead 21*, allowing air in the brake cylinders to escape quickly to atmosphere.

The double check *valve 19* provides for operating the brakes by push-button when in the position shown. It automatically moves to the left, shutting off *lead 18* when the brakes are operated from the brake control valve.



Schematic of wheel-slip control system.

HOW TO

Learn About Air Brakes

. . . AND HAVE FUN DOING IT

AB Brake Equipment 2-B

This is the second installment on the AB Equipment in the Air Brake in Color Schematics series. For the 2A installment and the color chart see page 87 of the November 1956 issue.

Equipment Arrangement

In this schematic we have purposely shown right angles in the piping for convenience. This would not be the case on actual equipment. Color the sketches in sequence, starting with Sketch 7.

Emergency portion during preliminary quick service (Sketch 7). When a service reduction causes pressure on the emergency piston to be less than that on the quick-action chamber side, the piston moves to the right. This continues until the emergency spring guide strikes hte left end of the slide valve. The piston carries the graduating valve to connect ports and passages. This allows quick-action chamber air to escape at the rate that brake pipe air is reduced on the opposing side of the piston. The operation is easily followed in the diagrams. Observe the encircled numbers and the attached explanations.

With a yellow pencil color the space at the right of the emergency piston, the passage into and including the block marked "strainer", the short passage to the service portion, and passage *b* "To Brake Pipe". Dampen with a brush and let dry.

Now, with heliotrope, color the entire space at the left of the emergency piston, including the space above the slide and graduating valves. Carry this to the underside of the spillover check valve, including the block marked "Quick-action Chamber". Proceed in passage *v-2* to "AT" (atmosphere).

When dampened and dried fill in with an orange pencil as follows: Starting above the spillover check valve, color *e-5*, into *e-3*, the upper end leading into a blank at the slide valve, and the bottom end leading into passage *e-2*, coloring both *e-2* and *e*. Dampen and let dry.

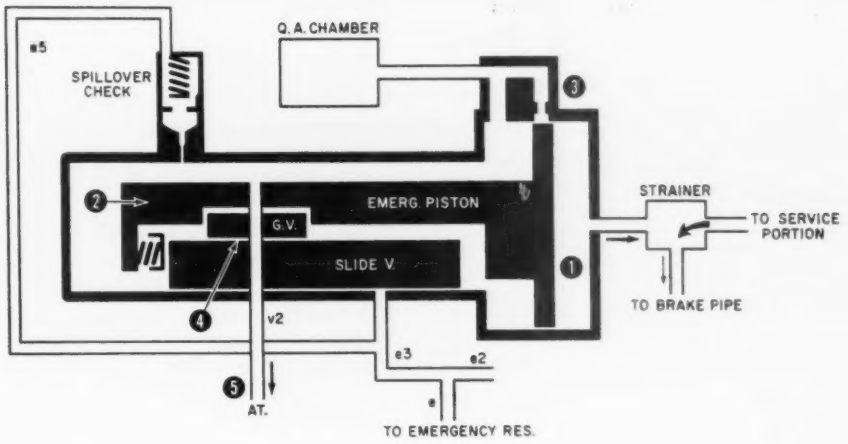
Service, second stage (Sketch 8). In the second stage of service, cylinder volume is built up from the auxiliary reservoir and brake pipe pressures. With dark green color the space to the right of the service piston. Continue above the slide and graduating valves, the charging passages and passage *a* to the auxiliary reservoir. Carry the dark green into passage *c3* through the slide valve. Stop at the slide valve seat. Again dampen and allow to dry.

Switch to yellow. Shade the narrow space at the left of service, the passage into and including the strainer, out of the strainer into the space to the right of the emergency piston. Continue in the passage from bottom of the strainer, passage *b*, the *b5* cavity in the service slide valve, passage *c8* into the quick service limiting valve, and the space around the check valves. Stop at the chamber entrance between the upper check valve and the diaphragm. Dampen and let dry.

Where the dark green ended, start with a pink pencil at the slide valve seat, fill passages *c3*, *c4*, and the space between diaphragm and check valve. Color the horizontal passage *c3* into *c6*, the cavity in the emergency slide valve and the passage leading down to the inshot volume. Include this volume, and the passage to the inshot piston chamber, coloring to the closed piston seat. Continue in passage *c2*, directly into the spring chamber of the inshot valve. Go past its seat and its passage to the brake cylinder. Dampen and dry. Again with heliotrope, color the quick action chamber as in "Preliminary quick service."

Service, third stage (Sketch 9). Pressure building up in the cylinder also increases under the quick service limiting valve diaphragm. When a 9 lb pressure is reached, the diaphragm is reflected upward, overcoming its spring. This permits the upper check valve to close, cutting off further flow of brake pipe air to the cylinder. Quick service activity stops until another service application is made.

Once more with dark green, color a very short part of passage *c3* through the service slide valve but stop where the slide valve contacts its seat. After dampening and drying, start at that point with a pink pencil, coloring passage *c3* into *c4* and the space under limiting valve diaphragm. Go on with pink from *c3* into *c6*, the cavity in the emergency slide valve, and passage *c7* into and through the inshot volume. Color into and include the spring chamber of inshot piston. Proceed



Sketch 7

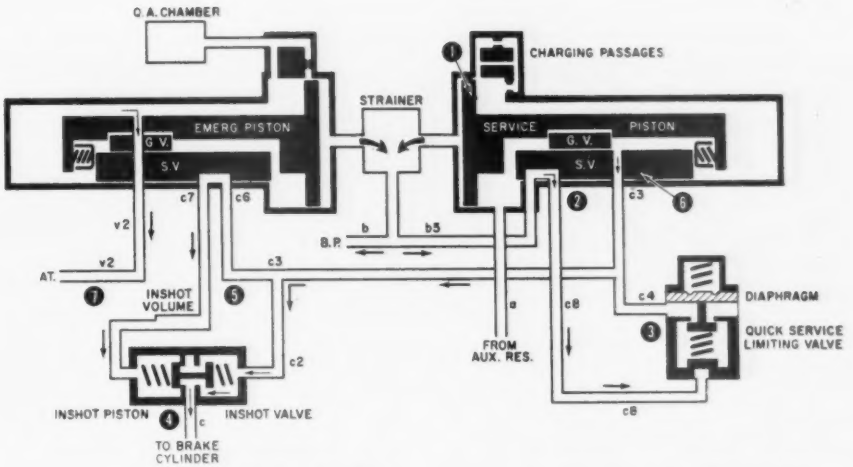
Emergency Portion During Preliminary Quick Service

1. Brake Pipe reducing at right of Piston.
2. Piston moves out until stopped at Slide Valve.
3. Charging Port, Brake Pipe to Quick Action Chamber closed by Piston.
4. Graduating Valve connects Quick Action Chamber to passage v2.
5. Passage v2 to atmosphere.

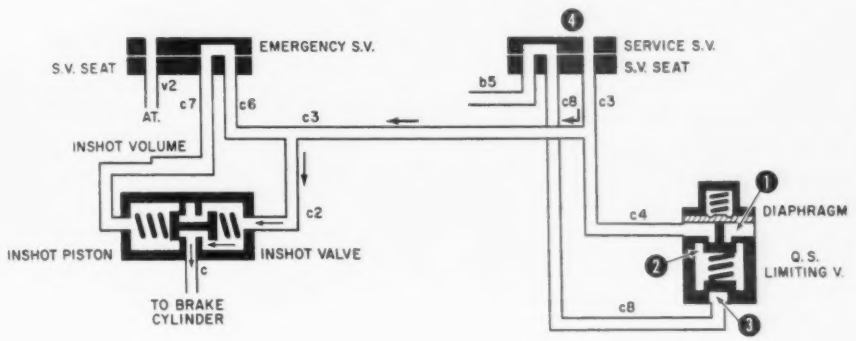
Sketch 8

Service, Second Stage

1. Brake Pipe reduction continues. The Service Piston moves to the extreme left, taking the Slide and the Graduating Valve.
2. The Slide Valve connects Brake Pipe passage b5 to c2 to Quick Service Limiting Valve.
3. Brake Pipe air past the Limiting Valve Check Valves to the Brake Cylinder passage c4, c3, c2 to inshot portion.
4. Past open Inshot Valve to passage c to the Brake Cylinder.
5. Brake Cylinder passage c3 to c6, through the cavity in the Slide Valve to c7 to Inshot Volume, to the left end of the Inshot Piston (holding the Piston Seat closed and the Inshot Valve open).
6. Auxiliary Reservoir air past the Service Graduating Valve to the Brake Cylinder passage.
7. Emergency portion as in "Preliminary Quick Service," (Quick Action Chamber to "AT" via passage v2.



Sketch 9 Service, Third Stage:

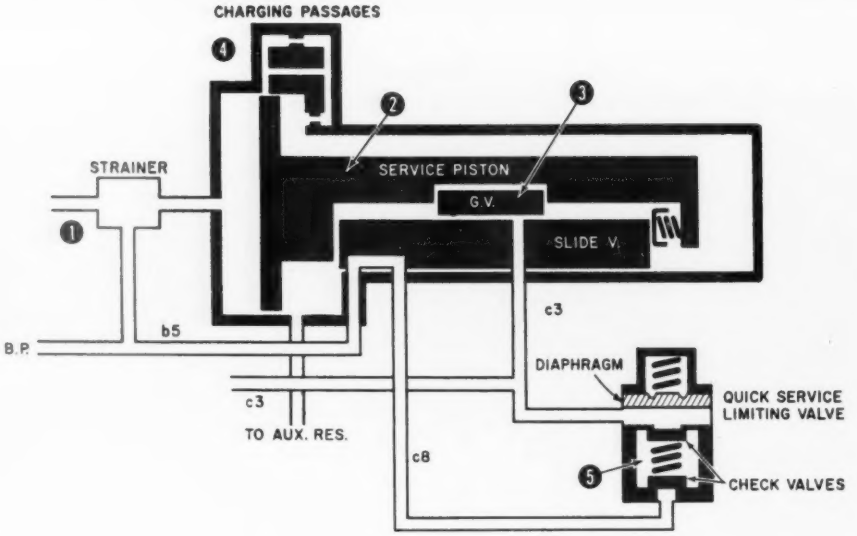


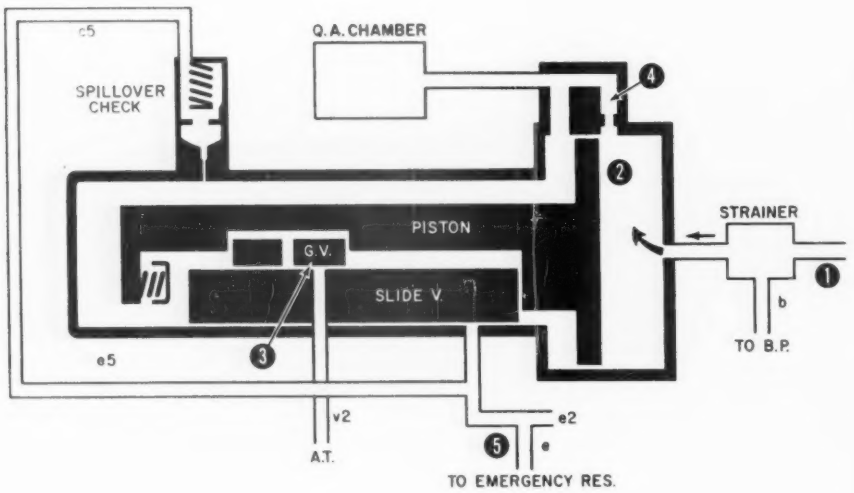
1. Brake Cylinder pressure having built up to approximately 9 lbs, overcomes the tension of the spring.
2. Diaphragm is deflected upward, the Check Valve closes.
3. Brake Pipe flow past Limiting Valve to Brake Cylinder stopped.
4. Auxiliary Reservoir air to the Brake Cylinder via c3, c2, past Inshot Valve, passage c to the Brake Cylinder.

Sketch 10

Service Lap, Service Portion

1. Brake Pipe reduction has stopped.
2. After the Auxiliary Reservoir pressure has reduced sufficiently, owing to flow into the Brake Cylinder, higher Brake Pipe pressure moves the piston to the right, to the Slide Valve.
3. The Graduating Valve closes the passage from the Auxiliary Reservoir to the Brake Cylinder.
4. The Charging Port from the Brake Pipe to the Auxiliary Reservoir is closed.
5. The Check Valves in the Quick Service Limiting Valve are closed.





Sketch 11

Service Lap, Emergency Portion

1. Brake Pipe Reduction has stopped.
2. After the Quick Action Chamber air has reduced below that of the Brake Pipe, the Emergency Piston is moved to the left, to the Slide Valve.
3. The Graduating Valve has closed the passage from the Quick Action Chamber to "AT" (v2).
4. Charging, the Brake Pipe to the Quick Action Chamber is now open.
5. The Emergency Reservoir volume is still fully charged.

from horizontal passage *c3* and fill in passage *c2* into the inshot valve chamber. Go past the open inshot valve to passage *c* to the brake cylinder. Dampen and let dry. With heliotrope color passage *v2* through the emergency slide valve and seat. This remains open as long as brake pipe pressure is being reduced in front of the emergency piston.

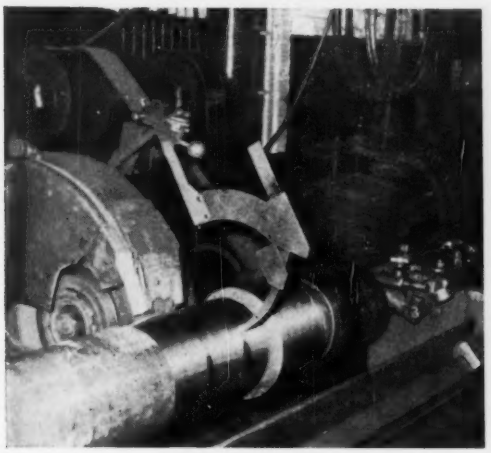
With a yellow pencil, starting at passage *b5*, color the slide valve cavity, passage *c8*, and the chamber between the two check valves.

Service, lap-service portion (Sketch 10). With dark green, color the space to the right of the service piston. Include the charging passages and the passage to the auxiliary reservoir. Dampen and let dry. A yellow pencil is used to color the space at the left of the service piston, into and through the strainer, passage *b5*, passage *c8*, and the space between the two check valves. Dampen and allow to dry.

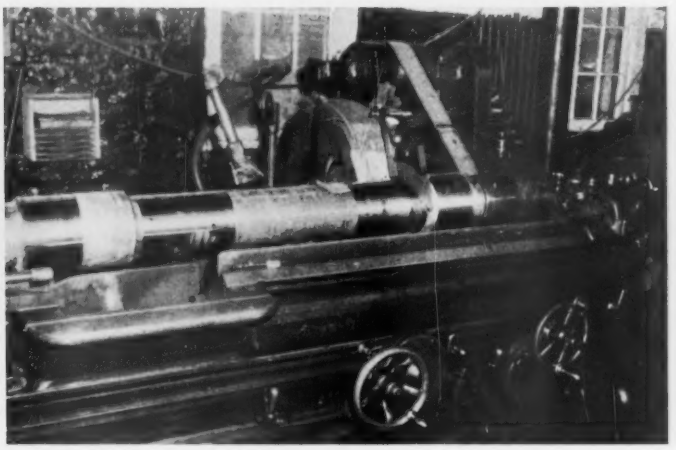
Once again, with a pink pencil, fill the space under the quick service limiting valve diaphragm, passage *c4*, passage *c3*, one branch blanked at the graduating valve, and another branch (unfinished) leading to the left. Dampen and let dry.

Service lap, emergency portion (Sketch 11). With heliotrope, shade the entire space to the left of the emergency piston. Include the quick action chamber, the passage leading to it, and proceed to the under side of the spillover check valve. Here, in heliotrope dashes, fill passage *v2* (blanked at graduating valve), as there is no pressure present at this time. The heliotrope in the charging passage should not go beyond the point where the passage meets the piston bushing. Start at this point with yellow and color the space to the right of the emergency piston, into the strainer and connecting passages. Dampen and let dry. Change to an orange pencil. Starting at the spring chamber of the spillover check valve, color passage *e5* (blanked at slide valve), passages *e3, e2, and e*. Dampen and dry.

Ideas for the Car Repair Man...



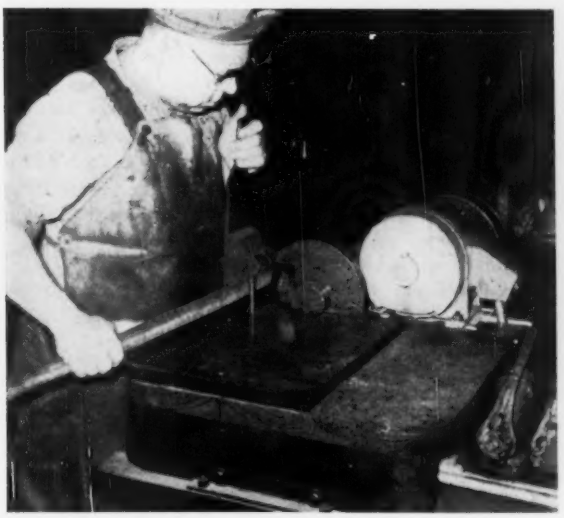
Cutting arrangement both for armored and rubber hose developed at the GM&O shops in Bloomington, Ill. The wheel, 8 in. in diameter and made of tool steel, takes but a few seconds to cut armored hose which takes the teeth off hack saws. The wheel is driven at 3450 rpm by a 1,750-rpm motor of 2-hp rating to maintain speed while cutting.



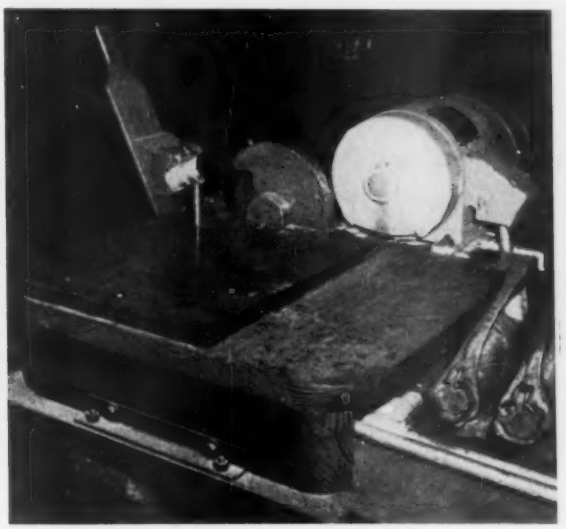
CONTINUOUS CHECKING OF GRINDING WORK.—The GM&O has equipped a grinder in the Bloomington, Ill., wheel shop with an Arnold hydraulic grinding gage (made by Federal Products, Providence, R.I.) which gives a continual indication while grinding an axle of how many thousandths of metal remain to be removed to bring the section to specification size.

The grinder to which the indicator is attached does the finishing of both car and diesel roller bearing axles. The indicator—which rides on the axle from the completion of the roughing pass until the grinding is finished—tells by its dial gage how much oversize the bearing section is at any stage of the operation as well as whether any taper burrs, or out-of-roundness exists.

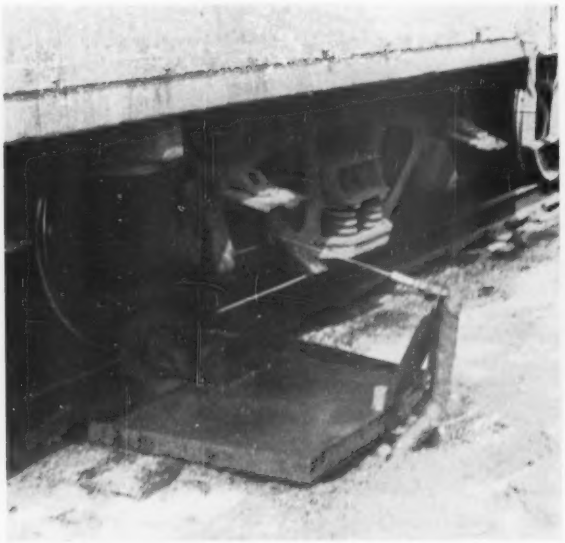
The indication is by three-point contact as shows in the sketch. The first step in its use is to mike the axle after machining. If, for example, it is .012 in. over the finished size called for the dial indicator is set at .012. When the indicator reads zero, the axle will be ground to required size.

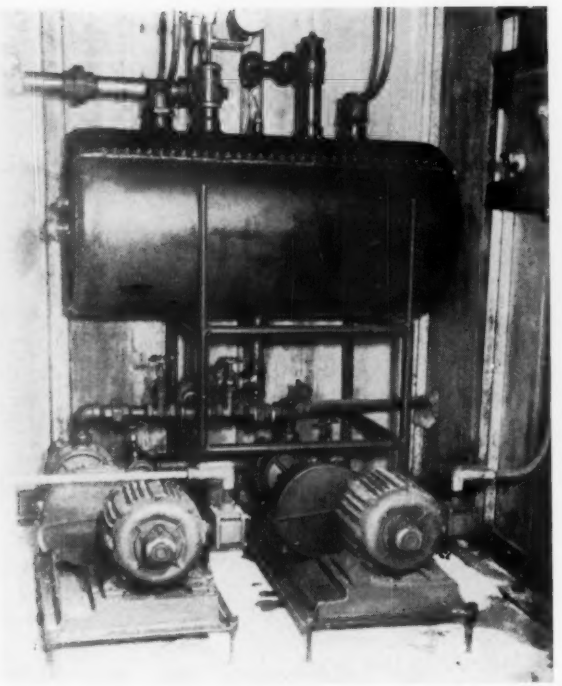


How the gage looks . . .



How it slips over the axle to give continuous measurement.





As each box passes the oiler, a jet of oil delivers about half a pint of oil to the box.
At right: Oil from the 10,000-gal. supply tank is pumped into a 40-gal. pressure tank in which pressure is maintained at 75 lb by pressure-controlled, motor-driven pumps.

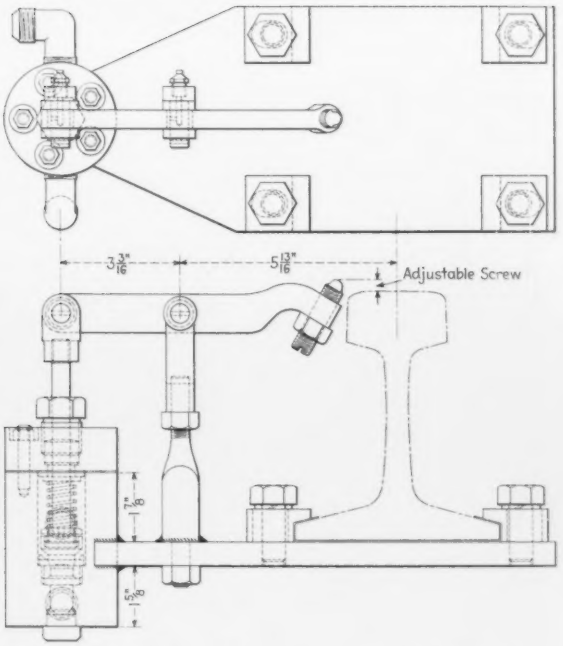
Automatic Journal Box Oiler

THE ROCK ISLAND has developed an automatic journal box oiler and has placed it in service in its Silvis, Ill. classification yard. The oiler is located 200 feet ahead of the hump, and as the cars pass, about a ½ pint of oil is added to each journal, on both sides of the car. In anticipation of the oiling, box covers are lifted when the air is drained in the receiving yard and the boxes are open when the cars pass the oiler.

Oil is delivered to the oiler at a pressure of 75 lb., and as each car wheel on one side of the car passes, it operates a valve which releases about a pint of oil, half of it going to the two boxes on opposite ends of that axle.

At humping speed, nearly all of the oil released by the

Left: At each oiler position, there is a 10-gal. standpipe in which the oil temperature is maintained at a constant temperature of 90 deg. Heater wire on the pipes insures the same temperature up to the control valve.



Details of the tripping mechanism. The amount of oil delivered may be controlled by adjusting the screw on the end of the tripping arm.

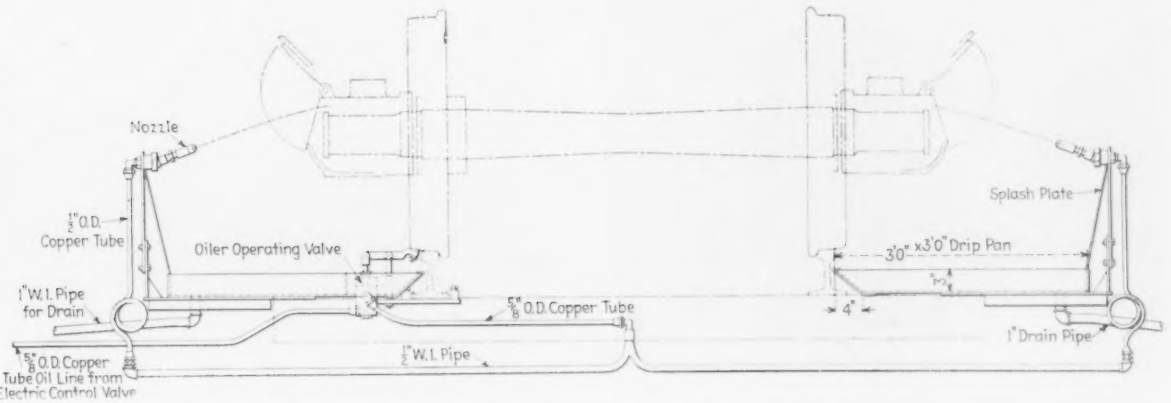
valve goes into the boxes. A small amount falls into drip pans from which it is drained, filtered and returned to the supply tank.

Two motor-driven pumps take oil from a 10,000-gal. main supply tank and pump it into a 40-gal pressure reservoir, automatically maintaining a pressure of 75 lb. The second pump will cut in at slightly higher pressure if the first fails to operate.

Operation of the system disclosed an important requirement of design. The upper portion of the pressure tank contains air which acts as a cushion and the pressure on this air controls the motor starters. In time the air will leak out of the tank and the tank will go solid. To take care of this situation, a small, intake air valve with a light spring is placed in the suction line. This lets in a little more air than is needed, and when the amount of air exceeds the desired quantity, a float valve releases the air in the tank to the atmosphere.

THE "MONSTER".—The Union Pacific adds a crane to its three steam-powered cranes of the same capacity already in use on the railroad. Powered by two 175-hp diesel engines driving two generators, it can move under its own power at a speed of three mph, supply air from its compressor for the brake system of a small string of cars, act as a switch engine in an emergency and set up for heavy lifting operations in about 10 minutes as compared to the 45 minutes to an hour needed to ready a steam-powered crane of similar capacity. Use of diesel power does away with the separate fuel and water car required by steam-powered cranes.

An immersion heater in the pressure tank holds the oil temperature at 90 deg. From the pressure tank oil is delivered to a standpipe holding 10 gal of oil placed at each lubricator position. Immersion heaters in the standpipes maintain a 90-deg oil temperature. Pipes from the standpipes to the lubricators are wrapped with heater wire and insulation and these serve to keep the oil at 90 deg right up to the release valves. A uniform delivery of oil is thus maintained at all seasons of the year.



The wheel at the left actuates the valve which releases oil to the boxes on both ends of the axle.

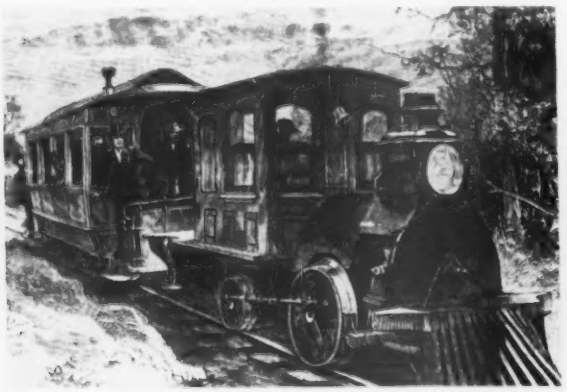
Electrification Will Come Back

- *Where did we come from?*
- *Where are we?*
- *Where are we going?*

Two CMSt P&P type EF-4 locomotives on the head end of a 5,800-ton train climbing eastward on the 1.7 per cent grade in the Bitter Root Mountains. A 4-unit, 8,000-hp helper locomotive is also used in the middle of these trains. The locomotives shown on the viaduct were built for Russia and converted for service on the Milwaukee.

RAILROAD ELECTRIFICATION is the term commonly used to describe the employment of motive power which consists of locomotives or multiple-unit cars which receive electric power from an overhead wire or a third-rail contact system. Such electrification for steam railroad service was inaugurated in the United States in 1895 on both the Baltimore & Ohio and the New Haven. From this beginning, it developed until 1937, the year in which the Pennsylvania extended its electrified lines from Paoli, Pa., to Harrisburg, Pa., the work involving 315 miles of line and 773 miles of track.

Total mileages electrified in the United States never exceeded three per cent of the total and in recent years several electricification installations have been abandoned. The reasons in most of these cases are that the electrification was installed for operation through tunnels and perhaps also over heavy grades. As diesels replaced steam locomotives, it became possible to operate through the tunnels without creating dangerous conditions and also to negotiate the grades to better advan-



Thomas A. Edison locomotive—predecessor of American electric locomotives operating on a circular track at Menlo Park, N. J. Picture was taken from a wood cut appearing in the July 15, 1882 issue of Harper's Weekly.

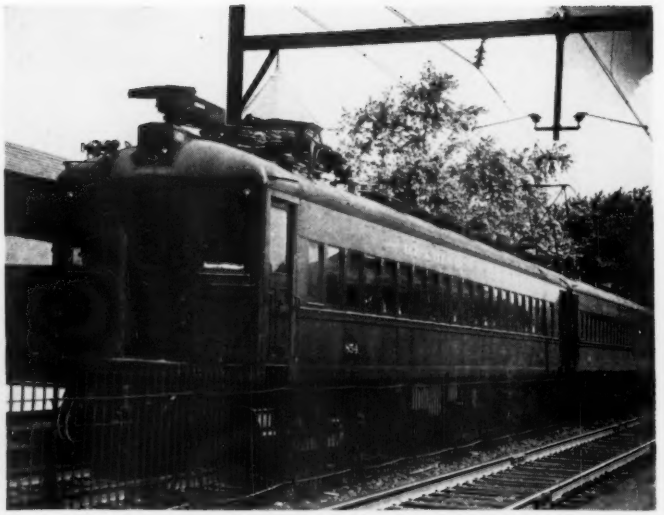
New York Central train operating along the Hudson river between Harmon, N. Y. and Grand Central Station in New York City. The locomotive is a converted 3,000-volt unit formerly used on the Cleveland, Ohio terminal.

An Illinois Central m-u train with two steam locomotives. The one at the left was the first type (Mississippi) used to haul commuter trains (1880 to 1926) and the one in the center was displaced by electrification.

Baltimore & Ohio electric locomotive hauling a passenger train through the Baltimore, Md. tunnel in 1895. This electrification, now abandoned, was the first mainline steam railroad electrification in the United States.

A Pennsylvania type GG1 electric locomotive. These units are used for both passenger and freight service. . . . . . *continued on next page*

Lackawanna suburban service was electrified in 1931 using a 3,000-volt d-c overhead contact system.



Reading suburban service was electrified in 1931 using a 12,000-volt a-c contact system.

tage. The change to diesels was made more attractive by the fact that it was no longer necessary to change locomotives at each end of the relatively short electrified sections.

Why So Little Electrification?

Railroad electrification had an auspicious early life. It was felt by many that it was only a matter of time until all steam locomotives would be replaced with electrics. But electrification has two inherent handicaps. A large financial investment must be made to provide the power supply and contact systems and to this are usually added costs of revision of the signal and communication systems. The second inherent limitation is that an electric locomotive cannot run out from under the overhead wire, and unless a line is completely electrified, it will be necessary somewhere to change motive power.

The large investment involved for wayside facilities must be amortized over a considerable period of years. It is, of course, difficult to look far into the future to determine what a railroad's needs may be, and top management which must make the decision is usually composed of men who have only a few years to serve with the railroad and who, being human, are more interested in making a showing during their regime rather than in providing for a future generation.

In the light of present-day knowledge, it appears that some of the early electrifications were built too expensively. Also, the respective proponents of a-c and d-c systems allowed themselves to become involved in "the battle of the systems." It has since been shown that either system will provide adequate performance at similar costs, but the argument raised doubts in the minds of prospective users.

Present Status

Electric locomotives now make up almost exactly two per cent of all the locomotives owned or leased by Class I railroads in the United States. Steam locomotives account for 14 per cent, as of October 1, 1956, and nearly all of the remainder are diesels. On this basis, there are those who maintain that our railroads are already more than 80 per cent electrified. To them our dominant form of motive power is not a diesel locomotive with electric transmission but rather an electric locomotive which incorporates a diesel engine which shortens the life and increases maintenance costs of electrical equipment and definitely limits the short-time overload rating of the locomotive.

It is pretty thoroughly established that the electric m-u car provides the most effective means of handling the mass transportation requirements of commutation service, subways and rapid transit lines. The electric system can deliver the high short-time overload rating that is necessary to permit of the high acceleration rates required for fast schedules with many stops. The Budd RDC cars are a contender for a part of this business and it is hoped that lightweight, diesel locomotive-hauled trains may improve passenger train schedules.

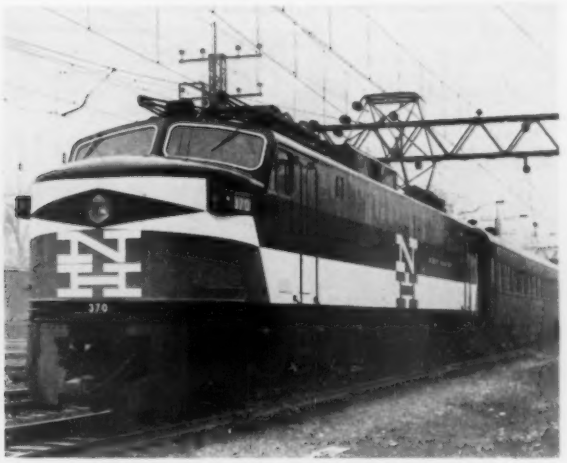
Performance on the Pennsylvania's electrified lines could probably not be equalled by any other form of motive power. Any encroachment by diesels except for switching service seems improbable. An extension would appear more likely.

The durability of an electrified system has been established on the Milwaukee with its 440- and 220-mile electrified sections. By means of a few changes, some simplification and the addition of some new motive power, this installation, now 40 years old, is matching or exceeding anything the diesels can do. The New Haven which was electrified in 1907 also has a contact system which is still good for another 40 years.

Where Do We Go From Here?

The diesel-electric locomotive is dominant in the motive power field. Any encroachment on its territory by electrification will probably be caused by the rising cost of fuel oil without a corresponding rise in the cost

A Virginian motor-generator type electric locomotive with its coal train. These locomotives could be operated on commercial frequency.



One of 10 rectifier-type locomotives in service on the New Haven. The road also operates 100 rectifier-type m-u cars.

of electric power. Expenditures for locating and developing petroleum in the U. S. doubled from $24 million in 1950 to about $51 million in 1955, while demand for oil both here and abroad continues to increase. Electrical energy, derived in the U. S. largely from coal and in part from water power, seems relatively less susceptible to a price increase.

Effective means of reducing first costs of electrification are available. It is now practicable to take 25,000-volt power from the contact system at commercial frequencies, change it to d-c power by means of conversion equipment on the locomotives and deliver it to d-c traction motors. This is being done in France, and the Belgian Congo, and will be used for the greater part of electrification to be installed in England and Japan. D-c motors for this application are now better and less expensive than formerly, because they are mass-produced for diesel-electric use. Rectifier locomotives and a motor car operating from 12,000-volt, 25-cycle a-c power system were worked out on the Pennsylvania, and the New Haven now has 100 such motor cars and 10 such locomotives in service. Twelve rectifier locomotives are being built for the Virginian. The electric locomotive is notable for low maintenance costs and diesel maintenance costs have climbed to a point (about twice that for electrics) which, coupled with obsolescence, indicates that they have an economic life which is closer to 15 than 20 years.

The gas turbine-electric locomotive is relatively a new comer which may help to bear out the often-repeated prophecy that the reciprocating engine will disappear. There are 25, 4,500-hp gas turbine locomotives in service on the Union Pacific and this railroad has placed an order for 15, 8,500-hp locomotives which may be increased to 45. This type of power source is capable of delivering enormous power in a relatively short self-powered locomotive, and it may be able to show low maintenance costs. In those areas where bunker C fuel is available at half the cost of diesel oil, its overall fuel cost is about the same as the diesel oil, since the thermal efficiency of the diesel is about twice that of the gas turbine locomotive. Perhaps the coal-burning gas-turbine may be able to show lower fuel costs. In its present form, the gas-turbine locomotive would seem unsuited to switching and transfer service and some road service, the reason being that it consumes about half as much fuel at idling as it does at full load. But, the 8,500-hp locomotive will have a better fuel rate and much higher ones are possible.

The atomic-electric locomotive too has potentialities, but designs can scarcely be said to have reached the drawing board. It is already possible to build such a locomotive, but present costs would apparently make it uneconomic and the size of the necessary protective shield just barely gets inside railroad clearances. At the moment, like an atomic airplane, it would apparently be primarily of military value because of being able to operate for long periods without refueling. Stationary atomic power plants seem to have a better chance of competing economically with other power sources and may furnish energy from contact systems to electric locomotives.

From 1935 to 1955, the price of fuel oil to the railroads rose from 4 to 9.4 cents per gallon. Dollar wise, this is little if any increase, but it is a considerable rise as compared with the cost of electric power. During 1955, the unit price of oil paid by the railroad declined slightly. This was due at least in part to the fact that the railroads are finding means of using lower-grade fuels, sometimes at the cost of increased maintenance. It appears now that these developments may temporarily stay the rise in the price of locomotive fuel. Unfortunately, as the demand for lower grades of oil increases, the price of these grades increases.

Diesel motive power will undoubtedly continue to serve the railroads capably for a long time. These will be continuing demands for more horsepower per unit and some of these may be met by the gas turbine. But with continuing demands for more power, increasing prices of locomotive fuel, and an appreciation of the relatively low maintenance and high performance characteristics of the electric locomotive, American railroads will again decide to electrify some of their lines. It would be foolish to try to say when, but an ultimate reversal of the current trend in the United States seems inevitable.

The Diesel With Shattered Nerves

By Gordon Taylor

A REAL PUZZLER for about two weeks, this case aroused an unusual lot of comment and speculation as to the cause of trouble.

The locomotive involved was a four-unit EMD F-3 freight locomotive. The case opened when a report was received that the three trailing units had failed in service and had to be towed to a repair point. The crew had changed out the jumper cable, but could not restore the units to service.

At the repair shop, the locomotive was carefully tested; but nothing was found wrong and, since it met all service tests, it was dispatched for service and made a successful trip.

However, on the following trip, it again failed, and the crew turned in a weird story as to all of the strange things that happened when the trailing units failed. In failing, the alarm bells rang, the engines shut down and the reverser changed from a *run* position to a *neutral* or *off* position.

Again, the locomotive was tested at the repair shop, but the trouble had disappeared and nothing would cause it to show up in the test at the service inspection track. The locomotive was again dispatched for service, ran several hours and then failed, with more confused reports as to its actions while failing.

The symptoms were very erratic as reported, and no two reports of the crew seemed to agree. The trouble was of the *come-and-go* type and it was always *gone* when the locomotive was at the repair shop. Thus, the case developed into somewhat of a mystery.

The cause of trouble was so elusive that it seemed that this group of units was haunted by some evil spirit that could hide away and hide the trouble until the locomotive was again out on the line far from its home terminal.

During this period of confused trouble reports, I could not help comparing it with a case of trouble that had occurred many years ago, on a Pullman sleeping car. In this earlier case, a Pullman porter reported, in a very worried manner, that something was wrong with the car to which he was assigned.

Asked what was wrong, he said "Last night the annunciator bell rang for berth No. 13, and when I answered the call, the berth was empty,—in fact it had not been occupied." He further stated that the same thing had happened a few nights before under similar circumstances. Asked why that worried him so, he said, "I am not superstitious, but that is the same berth that a passenger died in not too long ago, and it makes me wonder if that poor fellow is still ringing for help, or if it is a case of mixed up wiring. Something is mixed up, and something must be done!"

The porter's mind was placed at ease when it was discovered that the insulation on the wires leading to call button No. 13 had become chafed, and under certain conditions of vibration on the moving car, the wires would contact and register a call on the annunciator. A simple repair of the defective wire ended the mysterious trouble, and the porter said, with a sigh of relief, "That is mighty comfortin'."

A comparison of the trouble on the Pullman car and the mystery trouble on the diesel, clearly indicated that the latter must be associated with something that occurred only when the locomotive was in motion.

All reports seemed to indicate that a thorough check up on the nerve system, or the control system of the locomotive was in order. And in the words of the porter "something must be done."

It was decided to hold the locomotive out of service, until a fine comb inspection of the control system wiring could be made, starting with the jumper cable between the lead and the first trailing unit.

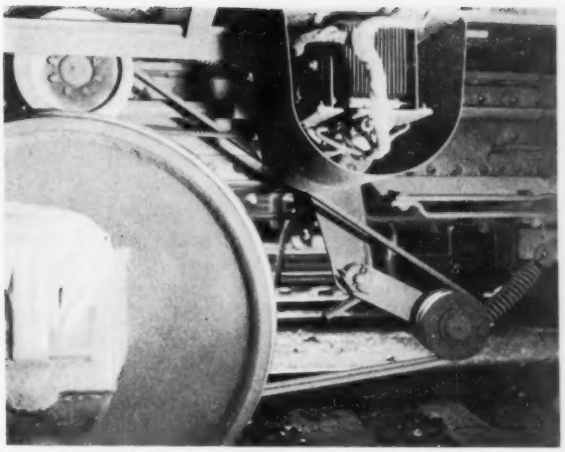
The jumper cable, as had several others previously used on this unit, tested okay.

We next completely removed the jumper cable receptacle from the front end of the first trailing unit, to examine the wire connections at rear of the receptacle. The connections were found to be okay.

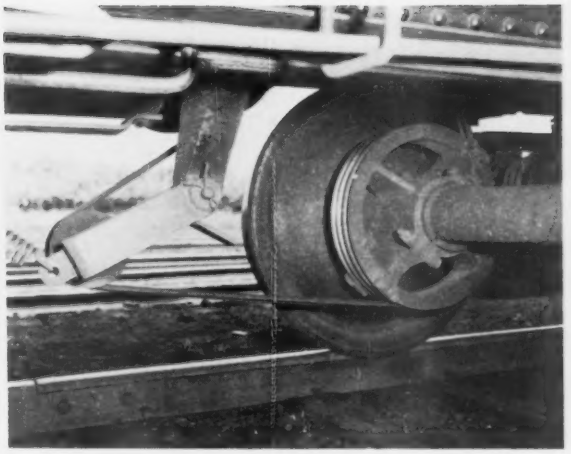
The receptacle was replaced and a test of the locomotive indicated everything was okay and the trailing units were responding properly.

(*Continued on page 60*)

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.



Two V-belts running over an axle pulley and an idler pulley drive the smaller of two pulleys on a jack shaft. Two V-belts from the larger pulley on the jack shaft drive a Leece-Neville generator.



Inside view of drive showing V pulley on the axle and long belt to minimize misalignment.

Caboose Power for Cold Climates

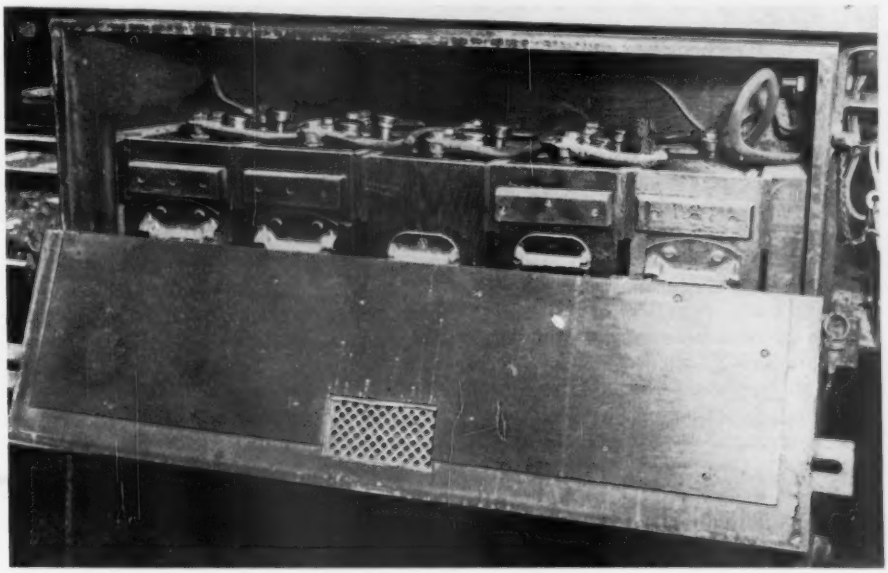
THOSE WHO EXPERIENCE cold weather for short periods can take a leaf out of the Ontario Northland's book if they need caboose radio power supply. On the northern end of this road, winter temperatures between 40 and 50 degrees below zero are common, and devices which do very nicely in warm weather have a way of giving trouble even, when it gets really cold. The Ontario Northland recently adopted train radio and has come up with a satisfactory answer to the power question.

Information, Courtesy of Storage Battery Power.

Ontario Northland meets the requirements with V-belt generator drive and tight insulated battery boxes

The power supply system (12 volts nominal) consists of a high-speed Leece-Neville alternator and a rectifier having a d-c output of 90 amp together with a 9-cell A8H Edison nickel-iron-alkaline storage battery.

The radio load amounts to 21 amp while transmitting, and 3.5 amp during receiving and standby. In



Battery boxes are insulated and snowtight.

addition, five outlets have been installed for 25-watt medium-base inside-frosted lamps representing a maximum load of approximately 10 amp. The maximum load connected at any one time is thus approximately 31 amp, compared to the 8-hour discharge rate of the battery, 42.5 amp. The capacity of the battery is estimated to provide an operating reserve of 16 to 18 hours for the average of the connected loads.

When it was originally installed, the alternator drive consisted of three V-belts and a combination of a flat driving pulley on an axle, two V-idlers and a V-driven pulley so arranged that only the flat sides of the belts were on the driving pulley. Tests showed that this arrangement was impractical for operation in cold weather because of belt slippage on the driving pulley as a result of ice and snow conditions.

Similar conditions had previously caused slippage of flat-belt axle generator drives on passenger-train cars. It was found that, at times, these conditions were so severe that belts were frozen rigid, and would remain completely motionless when the axle pulley would turn. This experience resulted in a program of installing positive drives.

To meet the same problem on caboose cars, the flat axle pulleys are being replaced with V-pulleys. The belts are being arranged to pass underneath the driving pulleys instead of above as before, thus permitting their V sides to run in the grooves of the V pulleys. To minimize the effects of changes in the position of the driving pulleys when the cars are on curves, the idler pulleys are located at a considerable distance from the driving pulleys, as shown in the illustrations.

Another associated problem is that of maintaining the storage battery within a satisfactory temperature range. The nickel-iron-alkaline batteries are used to avoid damage from freezing in the case of a generator failure.

The Ontario Northland's experience with positive generator drives on passenger train cars has shown that, even under the most severe weather conditions, the batteries can be maintained at satisfactory operating temperatures by means of suitably insulated, snow-tight battery compartments. So long as the normal amount of current is kept flowing through the battery in either direction during the run, experience has shown that enough heat is generated to maintain a satisfactory operating temperature provided this heat can be retained during the run and the normal layover periods.

To accomplish this purpose, the electrical department, more than 10 years ago, designed a battery box which has since become standard on passenger-train cars. Boxes of similar design are being applied to caboose cars.

These boxes are of welded steel construction. The overall outside dimensions are: length 3 ft 8 in. long, height 2 ft 4½ in. and width 17 inches. They are lined with ⅜-in. plywood exclusive of the floor which is 1-in. pine on which 8 battens of ¾ by 2¾ in. cross section are laid crosswise. Located equidistantly along the centerline of the floor are four $1\frac{3}{16}$ in. ventilating openings. A grating, 3 by 5 in. at the top of the door, which is snowtight, completes the arrangements for controlling the ventilation.

The radio equipment has been installed on 12 caboose cars and is being installed on 6 more.

The Diesel With Shattered Nerves

(continued from page 58)

Apparently, the trouble had corrected itself and the real cause was in hiding. Since we had declared war on this particular case of trouble, we refused to settle for anything less than the location and correction of the cause.

We decided to move directly back from the jumper cable receptacle to the first point where the control circuits might have a favorable spot to develop throuble. This led us to the terminal board located over the end door just inside the car body. Here all the wires from the rear of the jumper cable receptacle, attach to bolted connectors, that connect them with the control wiring system inside the car body.

That spot is where we found the villain that had caused so much trouble. It was the bolted connection on the terminal post that connects the *N-4* wire from the jumper receptacle to the *N-4* wire in the car body wiring system. The connection had been loosely made.

The copper terminal was confined to the bolt, but the nut had not been securely tightened and as a result the lug had been badly burned and corroded, so it no longer made a secure and dependable contact.

When the locomotive was standing and the vibration was at a minimum, the connection was good enough to pass the usual test. Even when the locomotive was in service the connection would often be good enough to permit operation for several hours, then suddenly trouble would appear.

It would be well to consider what caused the wide variation in trouble symptoms reported by the engine crews. That is easy to understand. The control system is composed of 27 wires (or nerves), that control all operating functions of the multi-unit locomotive. It is the nerve system that causes coordination of action between the lead unit and its trailing units.

One wire, *N-4*, provides the return circuit for the other 26 wires, or nerves. So *N-4* is the key wire of the system since all others depend upon it.

At any given instant, the trailing units are called on to function in a certain manner. If all those functions are interfered with by a failure of *N-4* wire, you can see that many different things will happen at the same time. What happens depends on the events that were taking place when the circuit through *N-4* wire failed. For example, the fuel pump circuit would fail, and the reverser controls would be interfered with,—in fact almost anything could, and did happen.

This case was rough on the nerves of the engine crews; and it was especially nerve racking to the maintainers as well as rough on the nerves of the locomotive.

When the case was closed out and the locomotive was once more a dependable member of the diesel fleet, all concerned heaved a sigh of relief, and echoed the sentiments of the Pullman porter, when he said, "That is mighty comfortin'."

The lesson to be learned from this case is to remember that the control system of the diesel locomotive is its spinal cord, and just as a pinched or severed nerve in your body will impair some bodily function, so will a similar condition in the nerve system of the diesel impair its proper functioning.

and Adjustable Locks

ADAPTABLE TO ALL DROP BOTTOM GONDOLAS

Wine Drop Bottom Locks and Spring Hinges have long been established as the practical method for drop bottom closure. Basic simplicity and ruggedness of the mechanism requires little or no servicing, and the accesible method of adjustment on the individual lock assures positive door fit.

Featuring single door operation, any or all doors open as required to control lading distribution. Maintenance-wise, a single door and mechanism may be dismantled without disturbing adjacent doors. The Wine Drop Bottom Combination offers all the important improvements — individual door fit, minimum maintenance, and easy, one man selective operation.

THE WINE RAILWAY APPLIANCE CO., TOLEDO 9, OHIO

Quantometer Speeds Evaluation

(*Continued from page 43*)

times in an effort to locate the water leak. By this time, all main bearings were found wiped but the crankshaft was saved. This proves that early detection of a water leak in the seeping stage can prevent subsequent potential engine damage or major repair costs.

In another case, water converted to steam by high bearing temperatures caused momentary washing of lubricant but the bearing was recovered with no damage. Air-borne dirt has caused a sudden increase in silicon and upsurge in lead value.

In the second example several valve bridges were found in bad order, as indicated by the increase in copper alone.

The typical silver reaction, shown in the third example, proved difficult to analyze. Every possible means was used to isolate the location without tearing down the engine. By coincidence, the cylinder assembly in which the highest clearance was found served to locate unusual wear of a silver wrist pin bushing (this is not considered a reliable method of finding such a condition).

The result of ring-belt blow-by in scoring an aluminum piston is illustrated in the final example.

C&NW Conclusions

The multiplier phototubes of the quantometer provide extremely high precision and sensitivity when compared with the photographic emulsion technique. The special technique developed by the C & NW lends itself to the desired precise, simple, quick, reliable and economical results and eliminates time-consuming operations, such as ashing and the use of an internal standard, for spectrochemical analysis of used diesel crankcase lube oil samples.

The reliable evaluation of analytical results is largely dependent on normal engine wear trend, engine history, correlation of metal and contaminants, and follow-up lube-oil sample results. Also to be considered are the various types of locomotive engines, nature of road service, and maintenance policies.

Difficult to trace was the failure in diesel engine valve bridges. Symptoms had been evident for almost entire month prior to the location of actual metal break-down.

SPECTROGRAPHIC ANALYSIS (PPM.)

EMD E-7 — 24

DATE AND POINT SAMPLED	Pb.	Si.	Fe.	Cr.	Al.	Cu.	Sn.	Ag.	Remarks
9-20-55	13	7	162	10	9	32	5	4.2	
9-27	13	8	184	5	4	(46)	6	2.8	Cu?
10-7	14	7	160	14	10	(43)	4	2.8	Cu?
10-13	12	10	188	15	10	(57)	1	3.6	Cu? CHECK ENG FOR CU.
10-25	17	12	208	9	8	(72)	1	5.6	
11-20	11	6	37	5	4	36	2	1.0	O.K.

SEVERAL VALVE BRIDGES WERE FOUND IN BAD ORDER

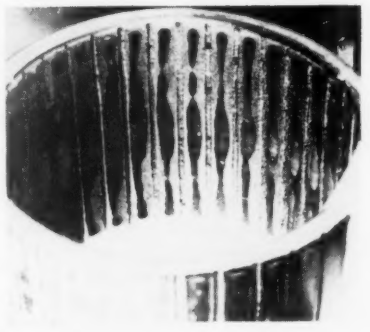
Silver levels were indicative of EMD wrist pin bushing failure. The lead readings did find cylinder assembly with faulty bushing here but will not always do this.

SPECTROGRAPHIC ANALYSIS (PPM.)

EMD E-8 — 26

DATE AND POINT SAMPLED	Pb.	Si.	Fe.	Cr.	Al.	Cu.	Sn.	Ag.	Remarks
11-24-55	3	5	54	7	6	40	6	4.2	
11-30	5	8	70	10	11	45	1	14	
12-2	3	1	52	8	4	38	2	(27)	
12-7	3	1	67	1	2	39	2	(32)	LEAD ENGINE.
12-21	3	1	83	2	1	45	1	24	
12-30	8	6	92	6	8	48	3	28	
1-8	4	8	44	5	10	25	1	10	

#9 WRIST PIN BUSHING CORRODED AND SHELLING.



Aluminum indicated scoring of piston in this Alco diesel engine. The iron concentration was high at the same time but the laboratory called for piston inspection.

SPECTROGRAPHIC ANALYSIS (PPM.)

ALCO — 28

DATE AND POINT SAMPLED	Pb.	Si.	Fe.	Cr.	Al.	Cu.	Sn.	Ag.	Remarks
12-12-55	3	3	19	1	1	2	4		
1-16-56	7	9	30	2	15	4	3		
2-17	9	(17)	(125)	2	(96)	11	1		INSPECT PISTONS IN SHOP
2-20	14	(24)	(142)	1	(108)	15	1		

#2 ALUMINUM PISTON SHOWING BLOWBY IN RING BELT & HEAVY SCORING.

PS-1
PS-2
PS-3
PS-4

Relied on by:

Akron, Canton & Youngstown
Alabama Power Co.
Amer. Smelt. & Ref. (Mexico)
American Sugar Refining
Ann Arbor Railroad
Atchison, Topeka & Santa Fe
Atlanta & West Point
Baltimore & Ohio
Bangor & Aroostook
Bessemer & Lake Erie
Birmingham Southern
Boston & Maine
Maine Central
Buffalo Creek R.R.
Canadian National
Canadian Pacific
Central Soya
Central of Georgia
Central R. R. of New Jersey
Chesapeake & Ohio
Chicago, Burlington & Quincy
Chicago & Eastern Illinois
Chicago & Illinois Midland
Chicago & North Western
Chicago Great Western
Chgo., Milw., St. Paul & Pac.
Chgo., Rock Island & Pacific
Chgo., St. Paul, Minn'pls & Omaha
City of Chicago
Clinchfield
Colo. Mill & Elevator Co.
Columbus & Greenville
Copper Range
Delaware & Hudson
Delaware, Lackawanna & West'n
Denver & Rio Grande Western
Detroit, Toledo & Ironton
Duluth, Messabi & Iron Range
Duluth, So. Shore & Atlantic
Elgin, Joliet & Eastern
Erie
Escanaba & Lake Superior
Ferrocarril Del Pacifico
Florida East Coast
Ft. Dodge, Des Moines & South'n
General American Trans.
Georgia Railroad
Western Railway of Alabama
Grand Trunk Western
Great Northern
Green Bay & Western
Gulf, Mobile & Ohio
Illinois Central
Industria e Comercio de Min.
J. C. Corrigan Co.
Kansas City Southern

PS-1 box car, **PS-2** covered hopper, **PS-3** open hopper, **PS-4** flat car

Lake Superior & Ishpeming
Lancaster & Chester
Lehigh Valley
Lehigh & New England
La Salle & Bureau County
Louisville & Nashville
Maine Central
Minn'pls, Northfield & South'n
Minneapolis & St. Louis
Mississippi Central
Missouri-Kansas-Texas
Monon
National Sugar Refining
Nashville, Charleston & St. Louis
New Haven
New York Central
N. Y., Susquehanna & Western
Nickel Plate
Norfolk & Western
North American Car Co.
Northern Pacific
Oliver Mining Co.
Pennsylvania
Phila. Qtz. of Cal.
Pittsburgh & West Virginia
Richmond, Fred'bg & Potomac
Rutland Ry. Co.
Santos a Jundiai
St. Louis-San Francisco
St. Louis Southwestern
Savannah & Atlanta
Seaboard Air Line
Southern Pacific
Southern Railway
Tennessee Central
Texas-Mexican
Toledo, Peoria & Western
Union Pacific
Union Railroad
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Virginian
Wabash
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standardized freight cars

from the experience of the world's largest carbuilder

Eleven years ago, Pullman-Standard first offered standardized freight cars to the railroad industry. This meant breaking with traditional custom carbuilding methods. But it opened a new era of carbuilder-designed freight cars, built to fulfill the needs of the railroads and their shippers.

Standardized cars get unusual strength from design, not merely from costly weight. And long runs of like cars allow full use of modern mass production techniques. The result and advantages of standardization: better freight cars with longer life, lower maintenance and reduced first cost.

The worth of P-S Standardized Freight Cars is proved by more than 110,000 units purchased and put on order by eighty-seven shipper-conscious railroads and sixteen other users. From 1946 to 1957, one-fourth of all U. S. box cars built have been PS-1 Standardized Box Cars.

And in recent years, Pullman-Standard has added the PS-2 Covered Hopper, PS-3 Open Top Hopper and PS-4 Flat Cars to its standardized line. Acceptance of these cars, too, has been outstanding.

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WORLD'S LARGEST MANUFACTURER OF FREIGHT AND PASSENGER CARS

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yes — **AND HERE'S WHY:** Every ¾-inch socket shown here solves a particular railroad nut-running problem. *Snap-on* makes this variety of ¾-inch hex wrench sockets and many more sizes and styles to give you just the one you need to match the job you have to do. Standard length, bolt clearance length, magnetic, Flexockets, power, power-impact and thin-wall types let you choose the socket to do your job faster and more efficiently, with less breakage.

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SNAP-ON TOOLS CORPORATION
Railroad Division
8130-A 28th Avenue • Kenosha, Wisconsin

SUPPLY TRADE NOTES

(Continued from page 10)

dent and director of American Brake Shoe Company, has overall responsibility for the new division. He was formerly president of both Ramapo and National Bearing Division.

Stephen S. Conway, a Brake Shoe vice-president and president of the Brake Shoe & Castings Division, has been named president of the new Railroad Products Division. *Eads Johnson, Jr.*, president of Southern Wheel Division, is vice-president, sales. *Roy L. Salter*, first vice-president of Southern Wheel Division, has charge of the production department. *Raymond A. Frick*, vice-president, Brake Shoe & Castings Division, is assistant vice-president of production. The engineering department is headed by *Rosser L. Wilson* as vice-president. Mr. Wilson has been director of mechanical engineering at the Mahwah research center and vice-president and chief engineer of Brake Shoe & Castings Division.

Within the new Railroad Products Division, four staff product managers supervise the lines of products offered by each of the former divisions. They are Joseph P. Kleinkort, for the Racor line of trackwork and specialties; John F. Ducey, Jr., brake shoe product line; Daniel C. Poor, wheel products; and Harry E. Connors, bearing products.

Three regional sales areas are being established. *Sam R. Watkins* has been named head of eastern region sales at New York; *Ralph L. Robinson*, central region sales at Chicago; and *Westley C. Muller*, western region sales at San Francisco.

■

MORTON MANUFACTURING COMPANY.—*Walter M. Klopsch*, plant manager at Libertyville, Ill., has been appointed to the newly created position of director of engineering, Chicago.

■

SKF INDUSTRIES, INC. — *Stuart H. Smith*, general sales manager, has been elected vice-president, sales.

■

NATIONAL MALLEABLE & STEEL CASTINGS CO.—*Frank K. Mitchell* has been appointed consultant and *Walter W. Matzke*, assistant manager, technical services, railway division. Mr. Mitchell was formerly assistant vice-president, equipment, New York Central, and Mr. Matzke, assistant superintendent motive power, Chicago & North Western.

■

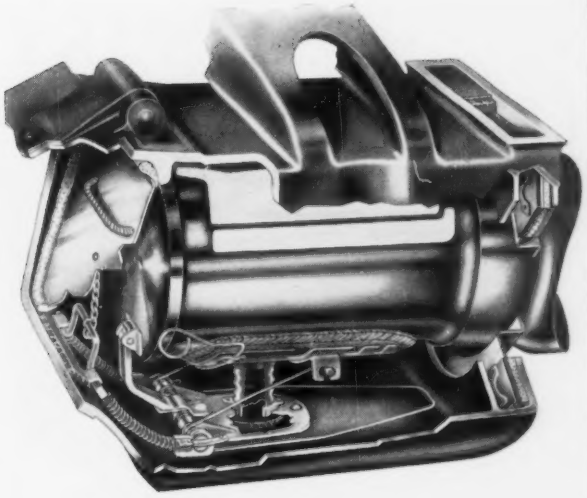
AJAX-CONSOLIDATED COMPANY. —*Seaboard Sales Corporation* has been appointed to handle sale of its products in the Northeast.

■

ALLEGHENY LUDLUM STEEL CORPORATION. — *Harvey B. Lucas* and *John H. Snedeker* have been appointed representatives, Northwest Coast area.

Obituary

F. W. LEWIS, engineering assistant to president, Chicago Railway Equipment Company, died at his home in Chicago on November 13.



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HENNESSY LUBRICATOR

For Freight Car Journals

- Positive mechanical delivery of oil of any viscosity in sufficient quantity to afford bath lubrication.
- Performance unaffected by heat or cold.
- Requires no attention other than additional oil as needed.
- Distributor part AR-1 renewal at 3-year intervals.
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- Eliminates hot boxes from usual causes.
- Reduces frictional resistance.
- Increases bearing life.

Hennessy Lubricator Co., Inc. has been engaged in the manufacture of mechanical lubricators for journals of railway equipment since 1922.

AR Type Lubricator for freight car journals in use since 1952.

More than 5,000 car sets have been sold; more than half of these have been in interchange service since 1953.

HENNESSY LUBRICATOR CO., Inc.

605 Guilford Ave. Chambersburg, Pa.

WHEN A THOUSANDTH OF AN INCH MEANS A MILLION MILES

The man in the photo is inspecting an Ex-Cell-O Railroad Pin to make sure it conforms to rigid standards, a tradition at Ex-Cell-O for 25 years. A fraction off in diameter and this pin flunks the test.

Extraordinary care in every step of manufacturing adds extra safety and extra mileage in every hardened and ground steel pin and bushing. A tough, ductile core withstands vibration, while a deep, hard case that is precision ground resists wear and the abrasive effect of substances from the roadbed. This combination gives bonus years of service — often up to a million miles of wear. One of the reasons why over 200 railroads and equipment builders prefer pins and bushings bearing the symbol, XLO.

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QUESTIONS and ANSWERS

Fairbanks-Morse

Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

Bulletin 1706, Sec. 104-A, Page 6.

F479-Q—What should be the action at a railroad crossing?
A—When approaching a crossing, throttle should be moved to notch *3* or below, and kept in that position until all locomotive units have passed over the crossing.

F480-Q—Why is this necessary?
A—To minimize possibility of traction motor flashovers because of brushes being jolted off the commutator.

F481-Q—When should a locomotive not be operated through water?
A—Do not operate a locomotive through water more than 4 inches above the rail.

F482-Q—What is the permissible speed when operating through water?
A—Not to exceed 3 MPH.

F483-Q—What should be done after passing through water?
A—Snap off generator field switch, move reverse handle to *OFF* and open throttle to 4th notch for about 10 minutes.

F484-Q—Why is this action advisable?
A—This will allow the water to be dried off the traction motors.

Changing Ends

F-485-Q—When about to change ends, what should be done with the controls, before leaving the cab?
A—The selector handle should be moved to *off*, the throttle to *idle*, and the reverse handle removed.

F-486-Q—Should the brakes be applied?
A—Yes. A 20 lb reduction should be made.

F-487-Q—Should the brake valve then be cut out?
A—Yes. The brake valve cut-out cock must be closed.

F-488-Q—In what position should the Rotair valve be placed?
A—The Rotair valve should be moved to *lap* position.

F-489-Q—What other action involving the air brake should be taken?
A—Both brake valve handles should be removed.

F-490-Q—What do you do at the engineer's breaker panel?
A—Snap *off* control, generator field and fuel pump at engineer's breaker panel.

F-491-Q—What do you do at the electrical cabinet
A—Snap off dynamic brake, electro-pneumatic brake and train control breakers.

New Leading Cab

F-492-Q—What do you do when boarding the leading cab?
A—Snap on fuel pump, control and generator breakers at engineer's breaker panel.

F-493-Q—What then should be done?
A—Snap on dynamic brake, electro-pneumatic brake and train control breakers on electrical cabinet.

F-494-Q—What else do you do in connection with the dynamic brake?
A—Check for the correct position of the dynamic brake unit switch.

F-495-Q—Where is the dynamic brake unit switch located?
A—Behind the engineer's seat.

F-496-Q—What should now be done at the air brake equipment?
A—Both brake valve handles should be inserted.

F-497-Q—What should be the position of the Rotair valve on the new leading cab?
A—*Pass* or "FRGT" position, as required.

F-498-Q—What next should be done?
A—Full independent brake should be applied and the brake valve cut out cock opened.

General Motors

Diesel-Electric Locomotives

This series of Questions and Answers pertains to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

Manual 2310, Page 222.

Operation over Railroad Crossings.

G560-Q—How should the throttle be handled in this case?
A—The throttle should be reduced to the 5th notch before reaching crossing and left reduced until all units are over crossing.

G561-Q—What benefit may be derived from this method of handling throttle?
A—This will reduce arcing from brushes to motor commutator.

Operating B Unit with Hostler's Control

G562-Q—Is operation at the hostler's station the same as an A unit?
A—Yes.

G563-Q—Where are the push button switches located?
A—Beside the controller.

(*Continued on page 68*)

Being interviewed is H. A. Fuggiti, Acting Senior Development Engineer

"Here's where the heavy slugs of power come from"

At the Exide Laboratories—**Reporter:** Just exactly what part of the battery is that, Mr. Fuggiti?

Fuggiti: This is the Exide-Ironclad positive plate. And in any battery, power reserve is governed by positive plate area.

Reporter: Then do you mean that Exide-Ironclad Batteries have *more* positive plate area?

Fuggiti: Exactly. You can see that here. The cylindrical power tubes are arranged in a row. So the semicircular sides give an effective plate area one-third more than the plate size.

Reporter: How does that increase power reserve?

Fuggiti: Because there's a bigger working surface of battery plate exposed to the electrolyte. Power response is faster.

Reporter: What does this mean in battery performance?

Fuggiti: It means the battery can provide power to spare for peak power loads as well as a dependable source for continuous loads.

Reporter: Obviously this is an important feature of the Exide-Ironclad Batteries.

Fuggiti: Yes it is, but it's just one of many engineering details that contribute to their long life and high capacity.

Note to battery users: Whenever you order heavy duty batteries or the equipment that requires them, be sure to specify Exide-Ironclad. For detailed bulletin, write Exide Industrial Division, The Electric Storage Battery Co., Philadelphia 2, Pa.

THE ELECTRIC STORAGE BATTERY COMPANY Exide®

QUESTIONS AND ANSWERS

(Continued from page 66)

G564-Q—Where is the brake valve cut-out cock and the bell valve located?
A—The brake valve cut-out cock is below the brake valve and the bell valve is a globe valve near the controller.

G565-Q—What transition is available?
A—Only No. 1 transition is available.

G566-Q—What does movement of the reverse lever automatically accomplish?
A—Movement of the reverse lever automatically places the locomotive in No. 1 transition.

G567-Q—Will operation of the B unit controls, operate all units joined to it?
A—Yes.

G568-Q—What must be done when securing the hostler control?
A—All push buttons must be pulled out, controller and reverser pinned, and the brake valve cut out.

G569-Q—Why must this be done?
A—Because these items can affect operation at any other station or cab.

Running Through Water.

G570-Q—What part of the locomotive should not, under any circumstances, come in contact with water?
A—The bottom of traction motor frames.

G571-Q—What is the maximum speed allowable when passing through water?
A—Two to three miles per hour.

G572-Q—At what height above the top of the rails is water likely to cause damage to the traction motors?
A—Water any deeper than 3 inches above the top of the rails.

6-SL Brake Equipment

This series of Questions and Answers pertains to the 6-SL air brake equipment for switching locomotives. The references to the pamphlet, page and part numbers in the text indicates where the original material may be found in the manufacturer's technical publications and instruction pamphlets. Authorized persons may obtain a copy of Instruction Pamphlet Number 5046-15 which deals with this equipment by applying to the nearest district office of the Westinghouse Air Brake Company.

W177-Q—With the application valve unseated, what takes place?
A—Main reservoir air in *a* is free to flow to the brake cylinders through a large capacity opening, providing an adequate rate of brake cylinder build-up for the large brake cylinder volume.

W178-Q—What additional ports are connected at this time?
A—Cavity *t* in graduating valve *28* connects ports *r* and *s* in the equalizing slide valve and by the same movement ports *r* and *s* register with *h2* and *1* in the seat.

W179-Q—What communications are thus established?
A—Application cylinder and safety valve are connected.

Pamphlet 5046-15 Page 39

W180-Q—When does the brake valve assume Lap position in reality?
A—Not until the brake pipe exhaust has been closed by the equalizing discharge valve.

W181-Q—Describe the action at the equalizing portion of the distributing valve after the brake pipe reduction has stopped.
A—Air from the pressure chamber continues to flow to the application cylinder and chamber until pressure chamber pressure is reduced below that in chamber *P* and the brake pipe enough to cause piston to move graduating valve to the left.

W182-Q—How long does this movement continue?
A—The graduating valve continues to move to the left until stopped when the shoulder on piston stem strikes the right end of equalizing slide valve.

W183-Q—What connection is then closed?
A—The graduating valve blanks port *z*, so no more air can flow from pressure chamber to the application cylinder and chamber.

W184-Q—What other flow of air is stopped by the graduating valve?
A—It has also closed port *s*, cutting off communications to the safety valve.

W185-Q—Why is it essential to cut off flow of air to the safety valve in Service Lap position?
A—So that any possible leak from the safety valve cannot reduce application cylinder pressure and thus affect the pressure in brake cylinders.

W186-Q—Describe the operation at the application portion of the 6-KR distributing valve after the equalizing portation has assumed Lap position.
A—Flow of main reservoir air past application valve *68* to the brake cylinders continues until pressure at the right of application piston 10 slightly exceeds application cylinder pressure at the left of the piston. Then the piston will move to the left.

W187-Q—What then takes place?
A—Springs then close application and pilot valves, preventing further flow of air to the brake cylinders.

W188-Q—What serves to prevent continued movement of the application piston to the left?
A—A greater differential of pressure on the application piston is required to move the piston and exhaust valve than the piston alone; therefore the piston movement stops when it comes in contact with the exhaust valve.

W189-Q—What are the pressures at this time?
A—At this point the exhaust valve still blanks exhaust port Ex., and pressures on both sides of the piston are balanced.

W190-Q—What movement takes place if brake cylinder pressure is reduced through leakage?
A—The piston will move to the right and open the pilot valve or application valve far enough to restore brake cylinder pressures to approximately that of the application cylinder. The piston will then be returned to Lap position.

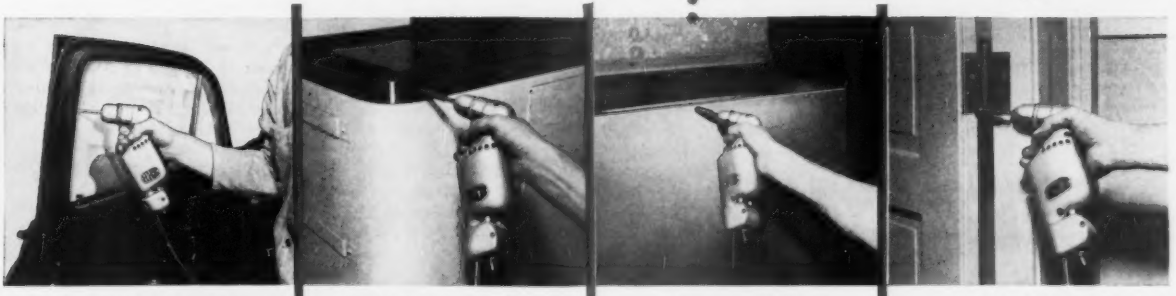
NEW

ALL-ANGLE ELECTRIC SCREWDRIVER

Here is really an amazing tool. It will do everything the conventional designs will do, and much more. It will work in extremely close quarters where there wouldn't be clearance for the others.

It will drive, set and remove wood screws, self tapping screws, lag screws, and machine screws and nuts. An optional adjustable clutch may be set to provide uniform tightness, or the operator can control tightness with hand pressure. Available bits include Standard Screw Driver, Phillips, and Socket Wrenches.

It will deliver the long, trouble-free Service everyone expects of a SIOUX Tool. Look for SIOUX under "Electric Tools" in the yellow pages.



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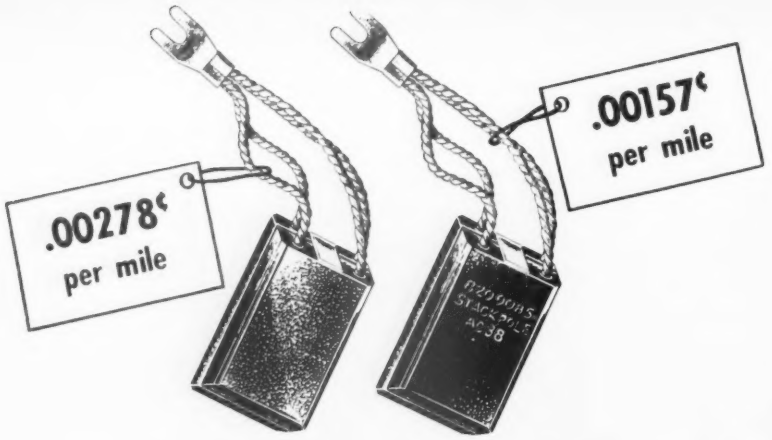


What if brush prices included commutator reconditioning costs?

Long diesel-electric brush life is highly important. By no means, however, is it the only factor by which brush efficiency should be judged.

Let's assume that brush type A has an average life of, say, 50,000 miles. Brush type B lasts 100,000 miles. Therefore brush A requires six changes in the usual diesel reconditioning span of 300,000 miles. Meanwhile, brush B is only changed three times.

But Type A is kind to commutators! Things run smoothly the full 300,000 miles. Type B, while lasting longer, bar burns the commutator to the extent that an extra reconditioning is required before the 300,000 mile mark is reached.

Brushes cost about $12 per set versus approximately $400.00 for commutator reconditioning. Thus the result is easy to figure: *The true cost of type A brushes has been about .00157¢ per mile as compared to the 77% higher cost of .00278¢ per mile for brush type B.*

While only a rough example, such figures show why Stackpole engineering is based on the firm belief that smooth commutation is every whit as important as long brush life—and that the best brush for most uses is the one that strikes a happy medium between these two sometimes incompatible factors.

STACKPOLE
diesel-electric
BRUSHES

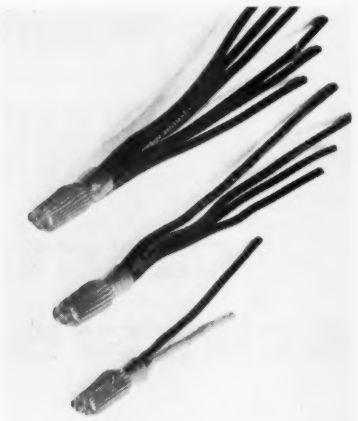
...They help keep diesels rolling... *profitably*

STACKPOLE CARBON COMPANY, *St. Marys, Pa.*

EQUIPMENT

(Continued from page 18)

of 95 centipoises with a solids content of 22 per cent, suitable for brushing as supplied. *B. F. Goodrich Industrial Products Company, Adhesives Division, Dept. RLC, Akron, Ohio.*



Pre-Insulated Wire Connector

This spring type electrical connector, Scotchlok brand R, makes solderless, ready-insulated splices in one step without the use of tools. It is said to provide a vibration-resisting pigtail splice that holds regardless of thermal or mechanical changes. It is approved by the Underwriter's Laboratories in meeting all requirements for high- and low-voltage building wiring, 1000 volts maximum, and 600 volts maximum fixture wiring.

The connector consists of a cone-shaped coil spring within a steel shell to prevent crushing in crowded junction boxes. Its vinyl insulating jacket features a triangular cross-section for better grip during application. Included is a skirt at the bottom to prevent flashover and protect the wires. The connectors are suitable for use on wire sizes from #10 to #16 AWG in 64 possible combinations. *Minnesota Mining & Manufacturing Co., Dept. RLC, 900 Fauquier street, St. Paul 6.*

Overheat Detector

This mercury thermal switch, with its built in permanent contact, is isolated in the housing to insure immunity to vibration and shock. It was produced to detect overheating of generators, alternators, bearings, etc.

The indicator can be furnished to give an alarm at a single temperature or at a multiplicity of temperatures. Application to existing apparatus is accomplished by providing a tapped hole to take the detector. Many types of mountings are available for

New Look for *El Capitan*

Passengers will soon find even greater comforts and attractions on Santa Fe's El Capitan. For years this luxurious all-chair train between Chicago and the West Coast has been a favorite with the traveling public. Now the proud train is to have a new look, and the look is more than skin-deep. It's all the way through.

Outstanding feature of the new El Capitan will be ultramodern two-level cars built by the Budd Company of Philadelphia. The consist of each train will be seven chair cars, with all seats on the upper level; a diner with the entire upper deck devoted to table space; and a dome-type lounge car that offers unlimited panoramic views of the landscape. All cars are fifteen feet, six inches high — two feet higher than conventional equipment.

Among the basic items of running-gear are Bethlehem wrought-steel wheels and forged-steel axles. Needless to say, these Bethlehem products are fashioned to the highest standards of workmanship; they are worthy components, like everything else in the cars. We at Bethlehem are happy indeed at this association with El Capitan, a famous train, and with the Budd Company, master carbuilders.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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BETHLEHEM WROUGHT-STEEL WHEELS

COMPANIONS TO BETHLEHEM FORGED-STEEL AXLES

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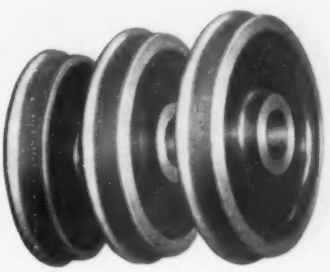
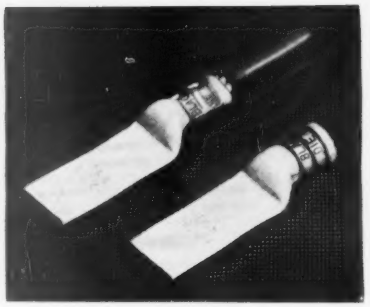


applications without modification of present equipment.

Weight of the unit is 0.065 lb. Ohmic values of the resistor is 800 ohms, drawing a current of 35 ma. It is 1.812 in. long and requires a regulated voltage supply of 28 volts dc. *Vapor Heating Corporation, Dept. RLC, 80 East Jackson blvd., Chicago 4.*

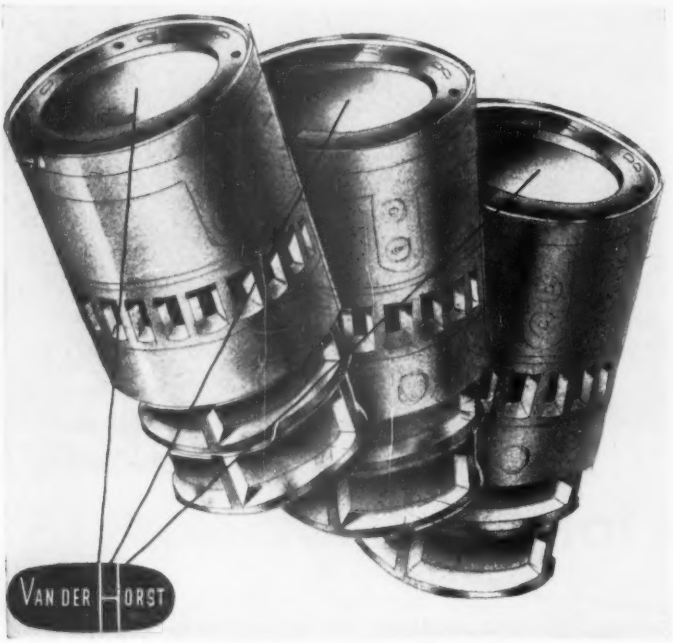
Adaptable Lug



Inventories of electric locomotive lugs can be reduced by stocking these adaptable blank tongue compression lugs for flexible copper conductors. The suggestion by the manufacturers is based on these features: The lugs terminate conductors from 37/24 to 1925/24 on all diesel electric locomotives. Available in straights, 45 deg and 90 deg angles, they are easily bent to other angles, any holes required in the tongue drilled, and any excessive length cut off.

Lugs for sized 37/24 to 550/24 are color keyed to dies in a compact TBM 5 installation tool. Correct choice of an installation die for a lug is quickly made by matching their coors. The TBM 5 hand tool compresses the lug and conductor into a joint of high tensile strength and low electrical resistance. These blank tongue compression lugs are wrought copper with an electro tin-plated finish. *Thomas & Betts Co., Dept. RA, 36 Butler street, Elizabeth, N.J.*

5 *big advantages of*



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Portable Lube Dispenser

This is a portable, manually-operated gear lubricant dispenser, with a steel cover. It can be clamped in 30 seconds to any standard 25 lb to 50 lb original refinery container. Designed for fast, clean refilling of transmissions, differentials, gear cases, final drives and other components, it includes a follower plate to assure positive prime in handling even the heaviest gear lubricants in any weather, and a 5-ft hose assembly with a curved, non-drip nozzle. Lubricant output is one pint per 10 strokes. It develops 400 lb maximum pressure. This unit is of all-steel construction, rust-proofed and finished in baked blue enamel. *Lincoln Engineering Company, Dept. RLC, 5702-14 Natural Bridge avenue, St. Louis 20.*

Discharge Line Check Valve

The Aircheck valve uses ring-plate-design, air-cushion valves with stainless steel valve discs and springs; is arranged in a cast iron or cast steel body to prevent automatically reverse flow and to

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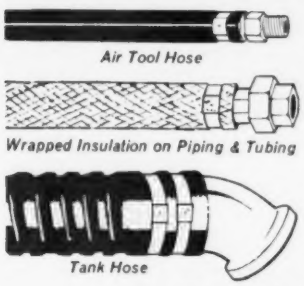
"You're right, Doc, and it's on to stay."

Wherever There's Hose . . . You'll Find
PUNCH-LOK HOSE CLAMPS



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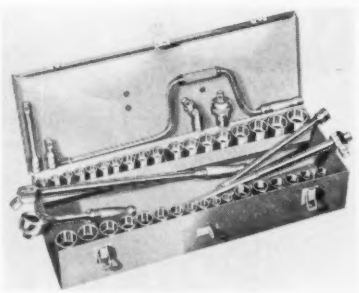
meet pressure requirements with either tapped or flanged connections available.

This valve, placed in the discharge line of air or gas compressors, eliminates the need for stop and safety valves, prevents leakage of pressure through the compressor when off or idling, damps pipe line pulsations, is quiet in operation and easy to maintain, with all parts accessible from outside. *Pennsylvania Pump & Compressor Company, Easton, Pa.*

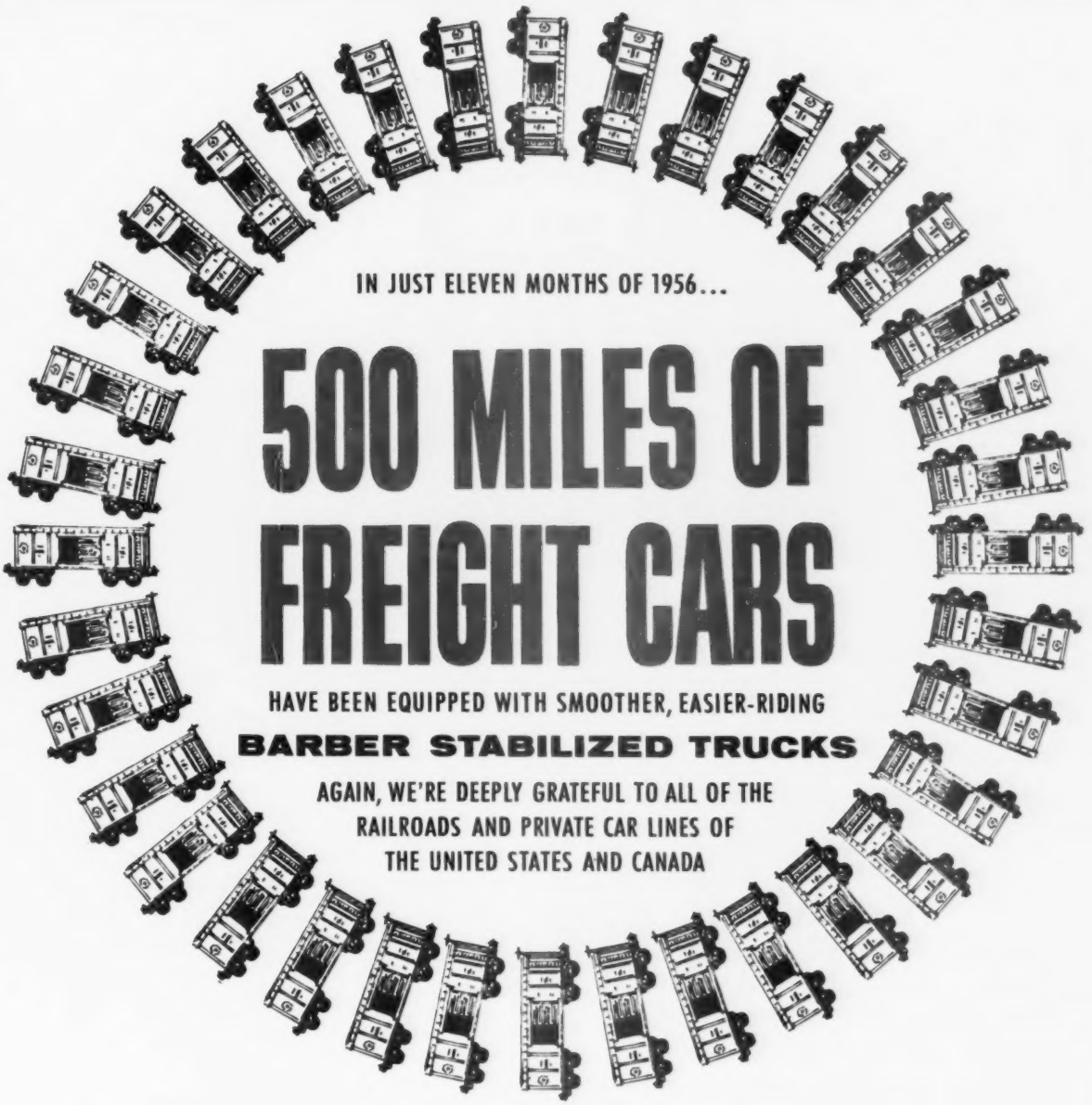
Suction Gun

This gun will service gear cases, transmissions, differentials and other components, or can be used for transferring any fluid lubricant. A flexible "Linpak" follower, impervious to lubricants, is precision fitted to the barrel. Even when filled to its maximum 18 oz capacity with nozzle held downward, lubricant will not leak out of the gun. The gun is of all-steel construction with rust resistant, gun-metal blue finish. It is supplied with non-drip nozzle and flexible tube. *Lincoln Engineering Co., Dept. RLC, 5702-14 Natural Bridge ave., St. Louis 20.*



Socket Wrench Set

A matched socket wrench set, initially developed for automotive maintenance, is now available to the railroads. The sockets,



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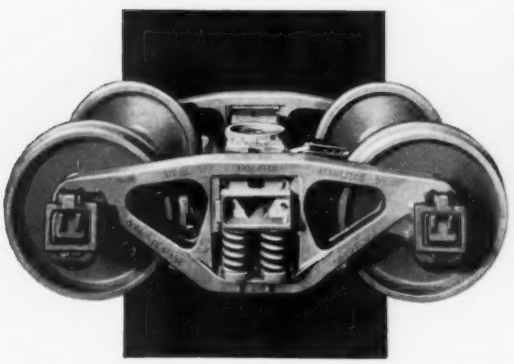

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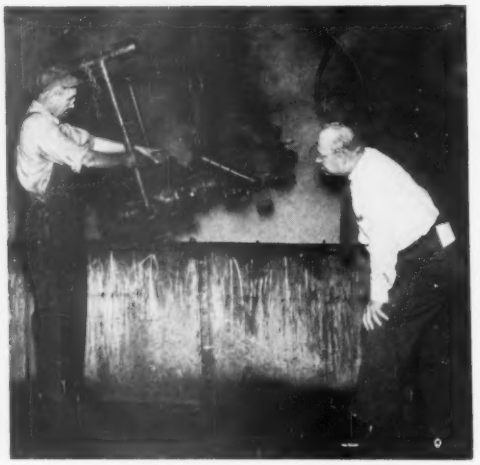
Standard Car Truck Company, 332 S. Michigan Ave., Chicago 4, Illinois. *In Canada:* Consolidated Equipment Co., Ltd., Montreal 2.

In PARTS CLEANING, too



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Another railroad shop recorded a yearly saving of over $4100 on material cost alone for tank cleaning of diesel heads, liners, pistons and other parts in a solution of Oakite Composition No. 24. This solution was used for a full year with minimum upkeep, while previous cleaner had to be dumped and replaced every 2nd month.

No matter what the maintenance cleaning job, there are *genuinely* economical, efficient Oakite materials to help you keep costs down. Get information on these and also up-to-the-minute methods and equipment from 56-page Booklet No. F-8055. Write Oakite Products, Inc., 46 Rector Street, New York 6, N. Y.

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of heat treated alloy steel accommodate a ½-in. square drive, are thin walled for application in close quarters and are chrome-plated.

Included in the set are eleven bolt-clearance-type hex sockets from ½ in. to 1⅛ in.; 18 standard double-hex sockets from ½ in. to 1¼ in.; six single-hex Flexockets from 9/16 in. to ⅞ in. All are in increments of 1/16 in. In addition, there is a 10-in. ratchet handle with adaptor, one 18-in. long nut spinner, a 15-in. sliding "T" handle, universal joint, one 19½-in. long speeder and three extension bars—2, 5, and 10 in. long. *Snap-on Tools Corporation, Dept. RLC, 8028 28th avenue, Kenosha, Wis.*

Metallized Crankshafts

A metal powder, Colmonoy C-250, developed to reclaim worn or scored crankshafts by the metallizing process, is a chromium-nickel powder containing chromium borides. It is said to have an unusually low coefficient of friction, controlled surface porosity and good oil retention properties. It is available in 5-lb containers. *Wall Colmonoy Corp., Dept. RLC, 19345 John R. st., Detroit 3.*

Two-Speed Electric Hoist

This electric hoist, equipped with fractional horsepower 1800/450 rpm motors, provides a fast lifting and lowering speed and a slow, ¼ normal speed, for gentle positioning. According to the manufacturer, this hoist parallels the sensitivity of control of air hoists. The housing of the hoist is designed so that the side and end covers can be quickly unscrewed for the servicing of exposed parts in a

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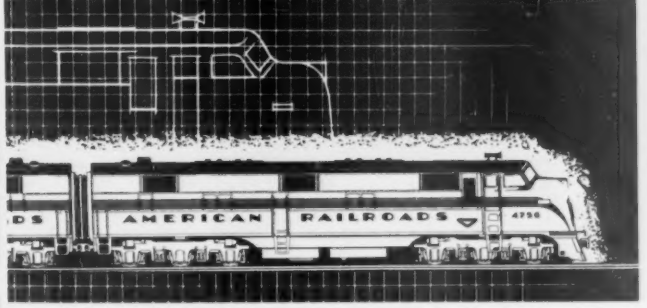

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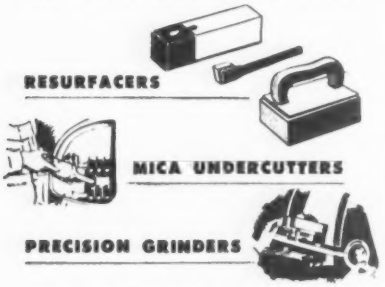

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It has been used in diesel cab interiors and is said to remove rubber "burns" from fork-lift tires on concrete. *Oakite Products, Inc., Dept. RLC, 146 Rector st., New York 6.*

HELPS FROM MANUFACTURERS

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information, write direct to the manufacturer.

MAGNETIC PARTICLE INSPECTION. Fifteen-page booklet gives a broad-scale outline of the Magnaflux-Magnaglo, or dry and wet methods of non-destructive testing of magnetic materials, with pictures of typical common defects that can be detected. Over 50 standard model units, portable and fixed, are available for many different inspection methods and needs; covering a wide range of uses on products, tools, machinery and equipment maintenance, and transportation and service industries. *Magnaflux Corporation, Dept. RLC, 7300 West Lawrence avenue, Chicago 31.*

ABRASIVE CUT-OFF SAWS. Forty-four-page illustrated book describes abrasive cut-machining units. It explains briefly the various types of abrasive cut-off saws. The portable combination cut-off and deburring chop saw. The large Wallace modular cut-off saw, capacity 5-in. standard pipe. The swing type cut-off saw for high production work, and rotating cut-off saw having 12-in. pipe capacity. Also a portable hacksaw and bandsaw. (Write: *Wallace Supplies Manufacturing Co., Dept. RLC, 1300 Diversey Parkway, Chicago 14.*)

LARGE NUTS. 4-page bulletin describes Locknuts, standard nuts, jam nuts, and slotted nuts of standard and special hexagon dimensions. Includes specifications for semi-finished heavy and light hex nuts. (Write: *Security Locknut Corporation, Dept. RLC, 1800 N. 15th avenue, Melrose Park, Ill.*)

SOLDERLESS WIRING. 8-page bulletin, "Solderless Wiring Devices," illustrates, describes and gives sizes and specification data on new time-saving solderless terminals and connectors for crimping to wire extremities. (Write: *Electric Terminals Corporation, Dept. RLC, 2021 Center street, Cleveland 13.*)

STEEL EQUIPMENT. 48-page reference Manual of Steel Equipment (No. 485) analyzes all types of steel shelving, drawers, lockers, work benches and tables, and other storage, store, office, and shop equipment. (Write: *Equipto, Dept. RLC, Aurora, Ill.*)

SILICONES. 12-page 1957 Guide to Dow Corning Silicone Products groups products by usage—water repellents, dielectrics, release agents, etc.—permitting the selection of a material by what it does as well as by what it is. Charts, tables and graphs compare various silicones with the materials displaced. (Write: *Dow Corning Corporation, Dept. RLC, Midland, Mich.*)

ARC RECTIFIERS. Four-page bulletin describes mercury arc rectifiers for steel mills, chemical plants, transportation systems, etc., with cross-sections of typical Allis-Chalmers sealed tube and of a pump evacuated excitron rectifier tube. (Write: *Allis-Chalmers Manufacturing Co., Dept. RLC, 1253 S. 70th St., Milwaukee.*)

PRESSURE GAGES. Four-page bulletin DH-23 features Helicoid line of pressure and chemical gages for use on engines, turbines, blowers, locomotives, compressors, etc., or wherever a gage is subjected to violent pressure pulsations or severe mechanical vibrations. (Write: *Helicoid Gage Division, American Chain & Cable Co., Dept. RLC, 929 Connecticut ave., Bridgeport 2, Conn.*)

CYLINDER HEAD SERVICE. 8-page booklet describes a service whereby diesel locomotive cylinder heads are reclaimed through the use of a combination of hard-faced valves and Nichrome seat inserts. (Write: *Diesel Reclamation Service Co., Dept. RLC, 479 Broadway, Bedford, Ohio.*)

NOMOGRAM. A Uni-Flo "Nomogram for Finding Outlet Area for Downward Jet of Heated Air" is a simple method for determining the size of grilles and round openings necessary to project the heated air of a given temperature to the floor. (Write: *Dept. 766, Barber-Colman Company, Dept. RCL, Rockford, Ill.*)

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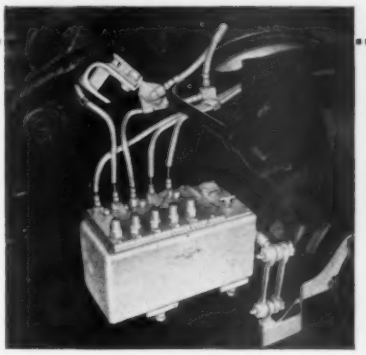

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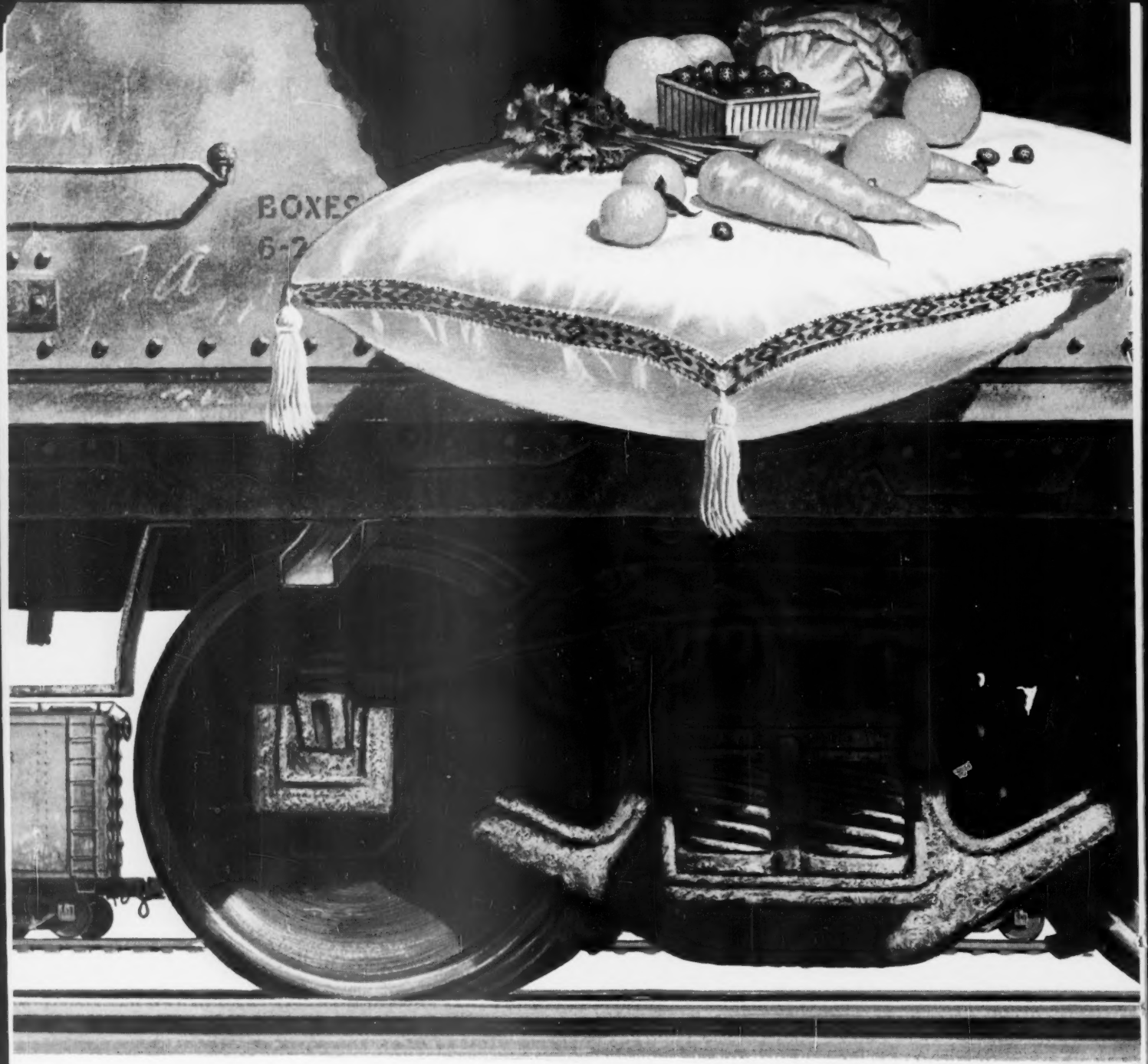

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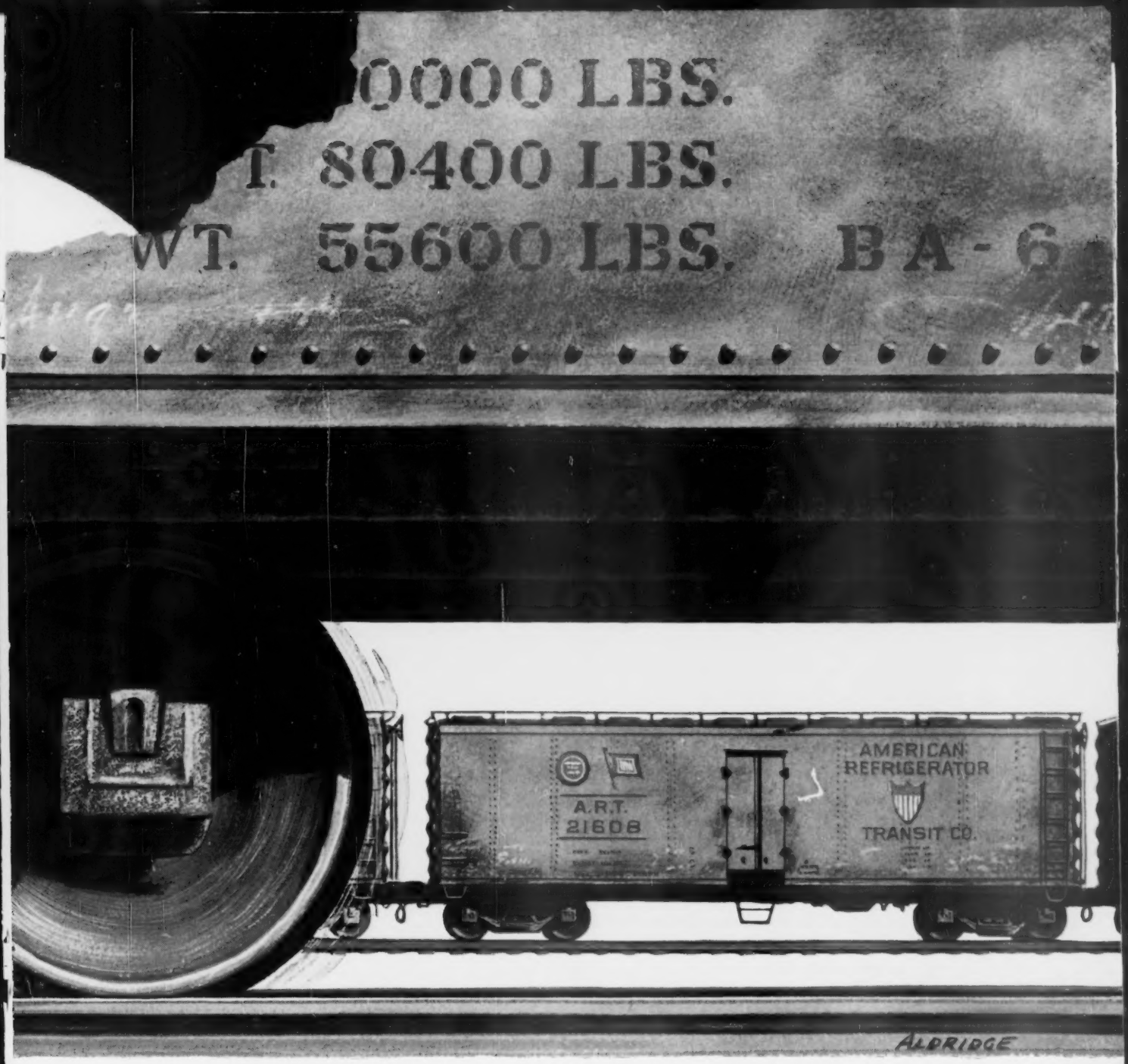

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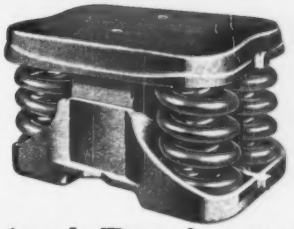

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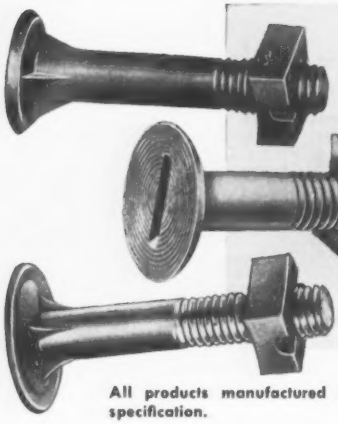

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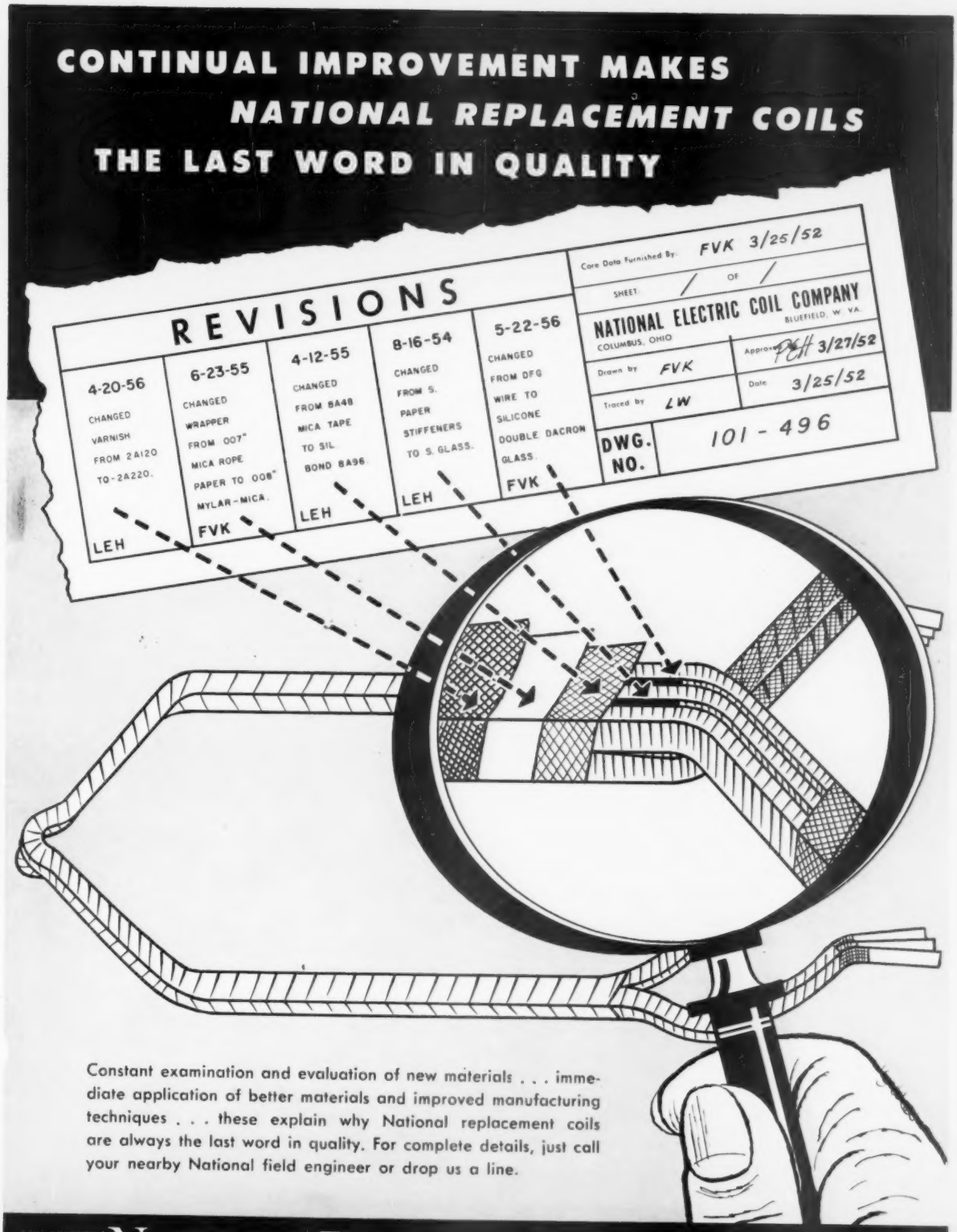

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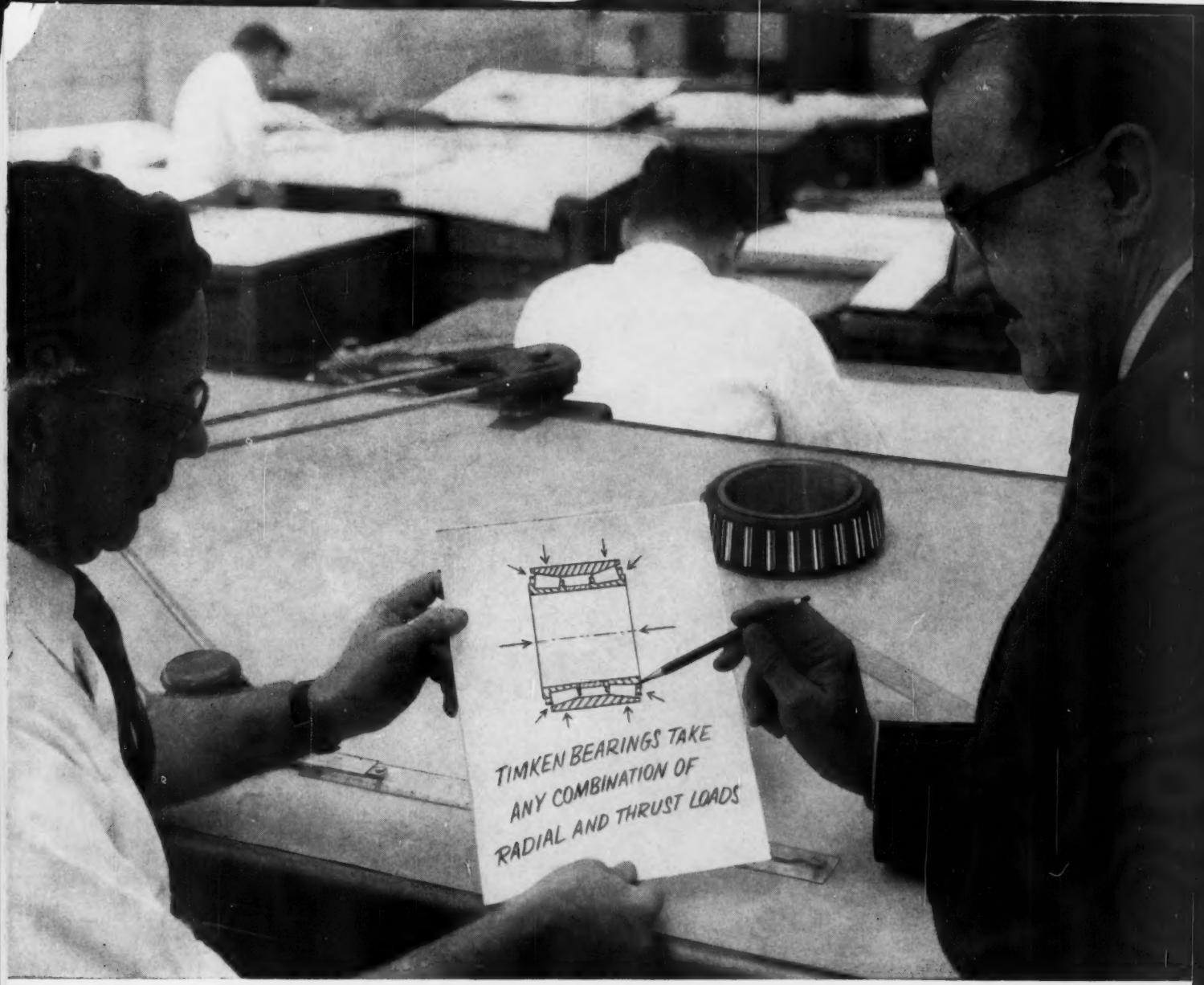

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Unlike costly "crutch" devices that merely attempt to improve friction bearing performance, Timken bearings remove the very *cause* of hot boxes—the friction bearing itself. And they deliver maximum operating and maintenance savings, too. Timken bearings cut terminal bearing inspection time 90%, reduce lubricant cost as much as 95%. The new Timken heavy-duty type "AP" (All-Purpose) journal bearing assembly will go three years without adding lubricant.

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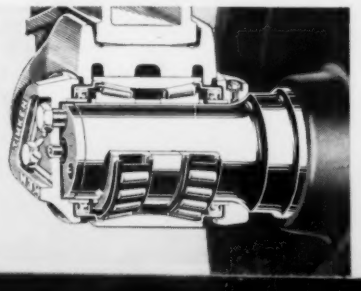

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